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United States Department of the Interior
Bureau of Land Management
Montana State Office

United States Department of Agriculture
Forest Service
Northern Region

July 1997

ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED COOKE CITY AREA MINERAL WITHDRAWAL

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FINAL

ENVIRONMENTAL IMPACT STATEMENT
FOR THE
PROPOSED COOKE CITY AREA
MINERAL WITHDRAWAL

July 1997

Prepared by

U.S. Department of the Interior
Bureau of Land Management
Montana State Office

and the

U.S. Department of Agriculture
Forest Service
Northern Region

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I

COOKE CITY AREA MINERAL WITHDRAWAL
FINAL ENVIRONMENTAL IMPACT STATEMENT

ABSTRACT

Lead Agencies: Bureau of Land Management (BLM), U.S. Department of the Interior; and Forest Service (FS), U.S. Department of Agriculture

Proposed Action: To withdraw from mineral entry federal locatable minerals on up to 22,000 acres near Cooke City in Park County, Montana. Federal hardrock minerals managed as leaseable minerals, and minerals acquired by the United States would also be withdrawn. The withdrawal would be subject to review after 20 years.

Abstract: This EIS analyzes the environmental consequences of two alternatives, i.e. a proposed mineral withdrawal and no mineral withdrawal (No Action). The proposed withdrawal of federal locatable minerals would not allow new mining claims to be filed on federal lands. Unpatented mining claims with valid existing rights and private lands would not be affected. The proposed mineral withdrawal would apply to minerals acquired in the future by the federal government. The proposed mineral withdrawal would also apply to any leasable hardrock minerals that are acquired by the federal government by purchase or donation. The Gallatin and the Custer National Forest Plans would be amended as needed to be consistent with the terms and conditions of a mineral withdrawal.

Under the "No Action" alternative, federal lands would not be withdrawn from mineral location and entry, i.e., federal lands would be open and available for mineral location and entry under the mining law. This alternative would continue the management that existed prior to September 1, 1995 when the study area was closed to locating new mining claims for a two-year study period known as a segregation. The Custer and Gallatin Forest Plans would not be amended regarding mineral location, entry, or recreational mining.

Following the publication of the final EIS, the Montana State Director, Bureau of Land Management, will submit a recommendation to the Secretary of the Interior concerning a mineral withdrawal. The Secretary of the Interior will decide what lands to withdraw, if any, and for how long. Concurrence on a withdrawal decision by the Secretary of Agriculture is required because lands under consideration for withdrawal are administered by the USDA Forest Service. If a mineral withdrawal is approved, the Secretary of Agriculture is the responsible official for Custer and Gallatin National Forest Plan amendment decisions.

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ACRONYMS AND CHEMICAL SYMBOLS

AB	Absaroka-Beartooth Wilderness
Ag	Gold
AIRFA	American Indian Religious Freedom Act
ARD	Acid Rock Drainage
ARPA	Archaeological Resources Protection Act
Au	Silver
BLM	Bureau of Land Management
CCAMW	Cooke City Area Mineral Withdrawal
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CERCLIS	CERCLA Information System (potential Superfund sites list)
cfs	Cubic Feet per Second
CFR	Code of Federal Regulations
CNF	Custer National Forest
Cu	Copper
CWA	Clean Water Act
DEQ	Department of Environmental Quality
DEIS	Draft Environmental Impact Statement
DNRC	Department of Natural Resources and Conservation
DSL	Department of State Lands
EIS	Environmental Impact Statement
EPT	Ephemeroptera Plecoptera Trichoptera
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act of 1976
FP	Forest Plan
FS	Forest Service
GIS	Geographic Information System
GNFFP	Gallatin National Forest Land and Resource Management Plan
GYA	Greater Yellowstone Area
HD	Hunting District
IDT	Interdisciplinary Team
km	Kilometer
kV	Kilovolt
KOP	Key Observation Point
LRMP	Land and Resource Management Plan
MA	Management Area
MABF	Mean Annual Base Flow
MDEQ	Montana Department of Environmental Quality
MDFWP	Montana Department of Fish, Wildlife and Parks
MIIH	May impact individuals, but is not likely to cause a trend to federal listing or loss of viability
MIS	Management Indicator Species
MO	Molybednum
MPDES	Montana Pollutant Discharge Elimination System
MSL	Mean Sea Level
MU	Multiple Use
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System (lands)
NHP	National Heritage Program
NHPA	National Historic Preservation Act

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NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NWM	New World Mine
NWMD	New World Mining District
NWP	New World Project
NYWR	Northern Yellowstone Winter Range
OHV	Off Highway Vehicle
OPT	Ounces Per Ton
Pb	Paladium
PDEIS	Preliminary Draft Environmental Impact Statement
PGE	Copper-gold-platinum group element
PLO	Public Land Order
PSD	Prevention of Significant Deterioration
RA	Roadless Area
RPA	Resource Planning Act
RPA	Resource Protection Act
RVD	Recreation Visitor Day
SHPO	State Historic Preservation Office
SIL	Scenic Integrity Level
T & E	Threatened and Endangered Species (federal)
TDS	Total Disolved Solids
TMDL's	Total Maximum Daily Loads
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VER	Valid Existing Rights
VQO	Visual Quality Objective

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CHAPTER 1
PURPOSE AND NEED FOR ACTION

SUBSTANTIVE CHANGES BETWEEN THE DRAFT EIS AND FINAL EIS

A discussion on the General Mining Law of 1872 has been added to the Background section.

A sentence indicating filing of additional mining claims is likely if the area is open to mineral entry has been added to the Background section.

A list of the purposes for a mineral withdrawal had been added to the Purpose and Need section.

Under Decisions to Be Made:

- a section was added indicating no action is required by Congress to implement a mineral withdrawal and how Congress can terminate a withdrawal.

- a sentence was changed to indicate the Secretary of Agriculture would amend Forest Plans to reflect the change in management of locatable and leaseable hardrock minerals, if the withdrawal is approved.

Under Decisions to Be Made, Decisions Beyond the Scope of the Analysis:

- a sentence was added indicating other non-mineral land uses are not affected by the withdrawal.

- a paragraph was added indicating the withdrawal does not apply to fluid minerals such as oil and gas and discussing the availability of the area for oil and gas leasing.

- a paragraph was added indicating designation of the area as Wilderness or a National Recreation Area is beyond the scope of this analysis.

- a paragraph was added indicating completion of the New World Project Environmental Analysis is beyond the scope of this analysis.

- a paragraph was added under explaining the timing of the mineral withdrawal decision in relation to the outcome of the New World Mine Agreement.

- a paragraph was added indicating federal acquisition of private land within the study area is beyond the scope of this analysis.

- a paragraph was added explaining why travel management decisions are beyond the scope of this analysis.

- a paragraph was added explaining why determining the validity of unpatented mining claims is beyond the scope of this analysis.

An entire section has been added entitled CONFORMANCE WITH LAWS, POLICIES AND REGULATIONS which discusses conformance with existing laws and regulations, compliance with national policy, and the relationship between mineral withdrawals and wilderness designation.

INTRODUCTION

This Environmental Impact Statement (EIS) discloses the potential environmental consequences of implementing alternatives for managing federal locatable and leasable hardrock mineral resources on National Forest Land near Cooke City, Montana. The USDA Forest Service (FS) and the USDI Bureau of Land Management (BLM) are co-lead agencies responsible for preparation of the EIS. The Secretary of the Interior will use the information in this EIS as the basis for a decision on future management of the federal mineral resource. The analysis in this EIS complies with provisions of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, Federal Land Policy and Management Act of 1976 (FLPMA), and the National Forest Management Act (NFMA).

BACKGROUND

The General Mining Law of 1872 is the basis for appropriation of hardrock mineral resources from the public lands. The Mining Law says: All public lands that are not specifically excluded from availability, are open and available for mineral exploration and development. A mineral withdrawal is a formal order that withholds federal lands and minerals from entry under the General Mining Law of 1872. It closes an area to mineral location (staking mining claims) and development. Withdrawals are implemented to limit mineral-related activities in order to maintain other resource values in the area (43 Code of Federal Regulations

(CFR) 2310). It does not affect private property or valid existing claims.

On August 25, 1995, President Clinton toured the site of the then proposed New World Mine near Cooke City, Montana, and expressed concerns about potential effects of mining on the area's outstanding natural resources. Following that tour, the President declared a two-year moratorium on the location of any new mining claims in the area. The two-year period provides time for lead agencies to complete an environmental study of a longer term mineral "withdrawal."

The petition to pursue a mineral withdrawal was approved by the Secretary of the Interior on August 28, 1995. With the publication of a *Federal Register* notice on September 1, 1995, the two-year moratorium on new mining claims (known as a segregation) went into effect. Unless a mineral withdrawal is approved by the Secretary of the Interior by August 31, 1997, federal lands within the area will reopen to filing of new mining claims. Filing of additional mining claims is likely if the area is open to mineral entry.

In response to the New World Mine (NWM) Agreement of August 12, 1996 (New World Mine Agreement, August, 1996), the withdrawal application was amended on September 16, 1996, and the amendment was published in the *Federal Register* on September 20, 1996, (Appendix A). The NWM Agreement between the United States, Crown Butte Mines, Inc. (Crown Butte), and the Greater Yellowstone Coalition, provides for cessation of the permit application process for the proposed New World Project (NWP), and acquisition of property interests held by Crown Butte in the New World Mining District. The amended withdrawal application expanded the scope of the withdrawal to include: 1) an additional 2,960 acres of National Forest land in the Kersey Lake area; 2) private mineral interests in the area if acquired in the future by the U.S.; and 3) leasable hardrock minerals.

GENERAL LOCATION AND GEOGRAPHIC SETTING

The proposed mineral withdrawal area (study area) is located in the Gallatin and the Custer National Forests near Cooke City, MT, Map 1-1. The study area is adjacent to the northeast corner of Yellowstone National Park (NP) and is bordered on the west, north, and east by the Absaroka-Beartooth (A-B) Wilderness in Montana. The state boundary between Montana and Wyoming forms the southern boundary of the study area. Adjacent to the southern boundary is the North Absaroka Wilderness and a non-wilderness corridor along US 212 and the Clarks Fork of the Yellowstone River (Clarks Fork).

The mountains within the study area form three watersheds. The northern portion of the study area drains north to the Stillwater River. The southwestern portion of the study area drains into Yellowstone NP via Soda Butte Creek, a tributary to the Lamar River. The southeast portion of the study area flows into the Clarks Fork. Elevations within the study area range from under 7,400 feet near Silver Gate to over 10,600 feet at Sheep Mountain.

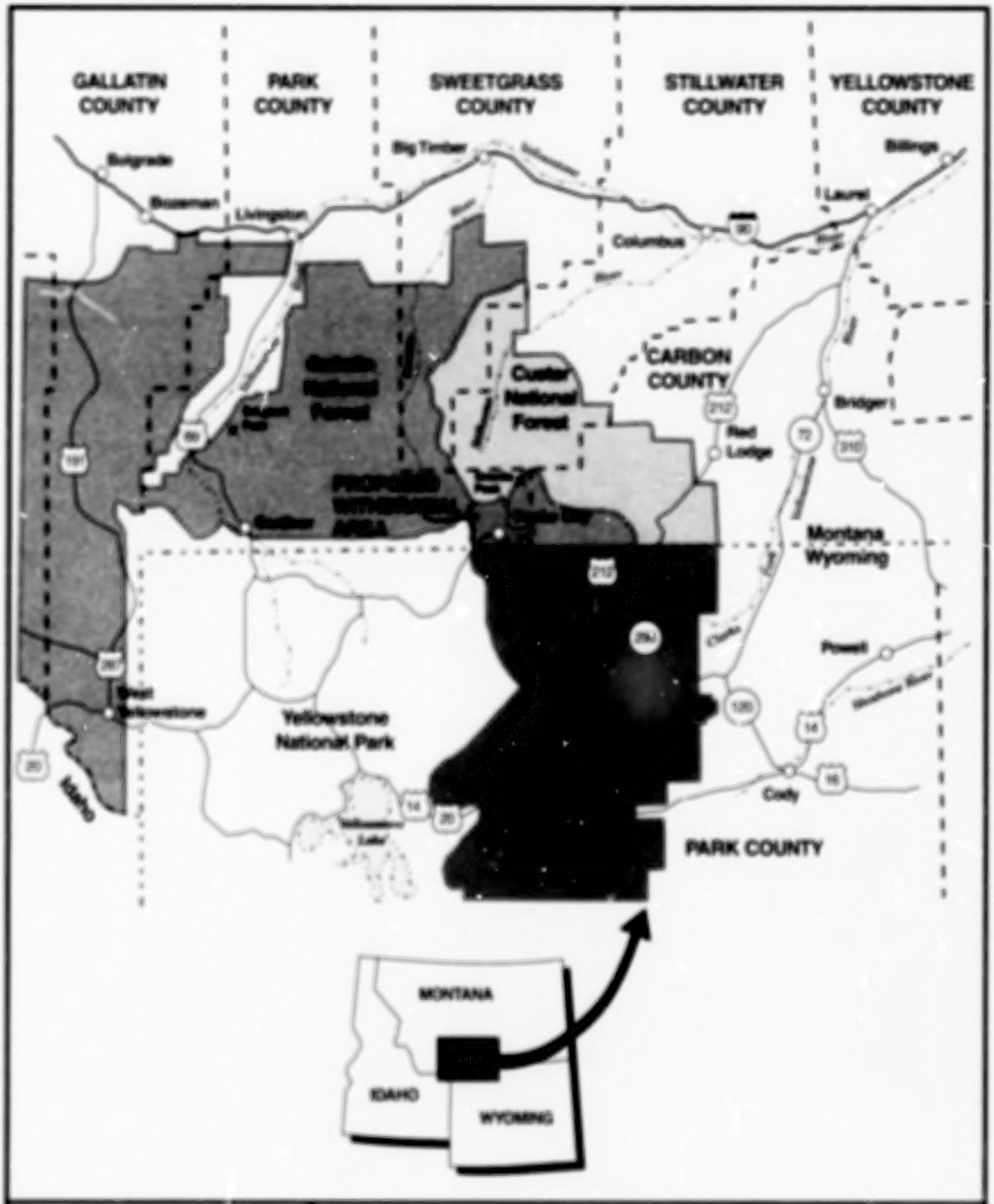
The study area consists of approximately 26,160 acres of both private and federal lands. Of this, about 22,000 acres are National Forest lands. Scattered throughout the area are about 4,160 acres of private land consisting primarily of patented mining claims. Prior to September 1, 1995, 470 unpatented mining claims are currently being maintained in the area. About 590 acres of National Forest lands are currently withdrawn from mineral entry to protect administrative sites and campgrounds in the area. Outside the study area, Yellowstone NP and the surrounding wilderness areas are withdrawn from mineral location.

PROPOSED ACTION

The Department of the Interior proposes to withdraw from locatable hardrock mineral entry National Forest land near Cooke City, MT and Yellowstone NP, Map 1-2. The proposed mineral withdrawal is for up to 22,000 acres of federal lands, subject to **valid existing rights** associated with the 470 existing unpatented mining claims in the withdrawal area. While all federal lands are withdrawn from mineral entry, the mineral withdrawal may or may not affect up to 4,240 acres of unpatented mining claims depending upon valid existing rights. If these unpatented mining claims are abandoned, or are determined to be invalid by the United States, mineral development activities would be limited at that time. The mineral withdrawal would immediately affect 17,760 acres of federal lands where no mining claims currently exist. The withdrawal would be subject to review at the end of 20 years.

Also subject to the proposed withdrawal would be any private minerals that may be acquired in the study area by the United States. For example, if the U.S. acquires private minerals in this area, which may occur under the NWM Agreement, the acquired minerals would not be available for mineral entry under the General Mining Law of 1872, (30 USC 21-54). Any acquired minerals would also be withdrawn from hardrock mineral leasing under the Acquired Lands Mineral Leasing Act of August 7, 1947, (30 USC 351-359).

If the proposed withdrawal is approved, the Custer and Gallatin National Forest Land and Resource Management



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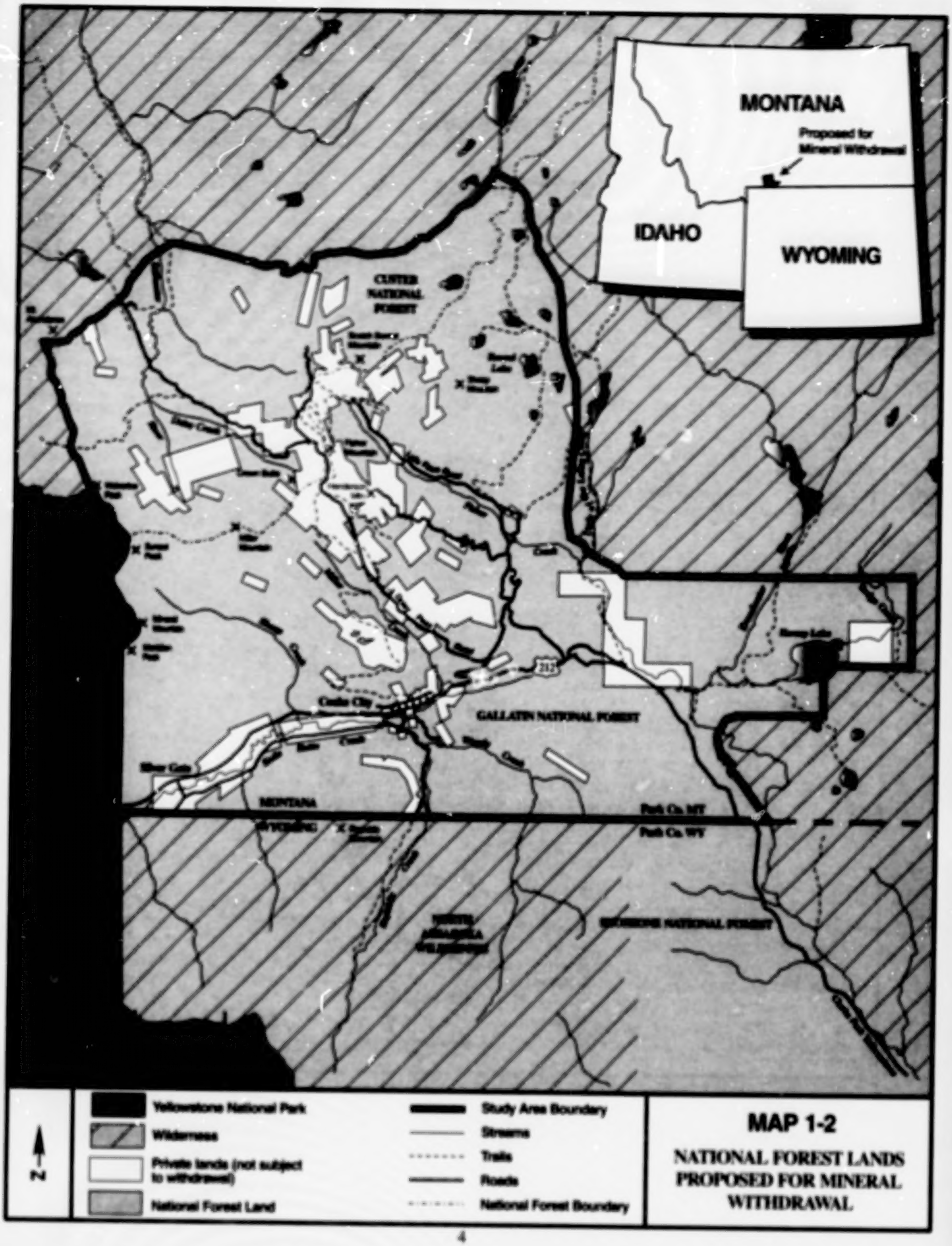
MAP 1-1

General Vicinity of the Proposed Cooke City Area Mineral Withdrawal



MAP 1-2

NATIONAL FOREST LANDS PROPOSED FOR MINERAL WITHDRAWAL

Plans (Forest Plans) would be amended. Appendix D of the Gallatin Forest Plan and Appendix IV of the Custer Forest Plan would be amended to include the mineral withdrawal. In addition, the Gallatin Forest Plan would be amended to reallocate areas within the study area currently allocated as Management Area 24, (minerals emphasis), to Management Area 15, (grizzly bear/dispersed recreation emphasis).

PURPOSE AND NEED

President Clinton expressed concerns about the effects of mining on the area's outstanding natural resources. The Assistant Secretary of the Interior (Policy, Management, and Budget), with concurrence of the Under Secretary of Agriculture (Natural Resources and Environment), proposed the mineral withdrawal. A withdrawal is an administrative tool, available to the Secretary, to limit mineral-related activities in order to maintain other resource values in the area. Purposes for a mineral withdrawal may include quality of scientific, scenic, historical, ecological, environmental, air, water resources, archaeological values, or other special purposes (Forest Service Manual 2760).

The primary purpose for the proposed Cooke City Area Mineral Withdrawal (CCAMW) is to protect water quality and fresh water fishery resources within the watersheds of Soda Butte Creek, Clarks Fork River, and Stillwater River from the effects of future hardrock mining activities that could occur on federal lands in the headwaters of these streams. Based on public comments received during scoping, other identified reasons for the withdrawal include protection of surrounding wilderness areas, scenic integrity, recreation opportunities, cultural resources, and wildlife habitat.

The study area and surrounding federal lands form the headwaters of Outstanding Natural Resource Waters, including streams which flow through Yellowstone NP and Wilderness areas. Segments of the Clarks Fork, Stillwater, and Soda Butte Creek are either designated or eligible as Wild and Scenic rivers. Certain mining-related activities pose risks to these watersheds (Appendix H, Failure Modes Effects Analysis). These risks include the potential for increased acid-rock drainage, the potential for groundwater contamination from underground mines, potential for failure of tailings impoundments and uncertainty of mitigating effects to wetlands. Withdrawal of these lands would help ensure that the physical and biological integrity of these important downstream watersheds is maintained. The risks and uncertainties associated with mining-related activities on federal lands would be reduced.

The segregation, which prevents the location of new mining claims for two years, expires on August 31, 1997. Unless a mineral withdrawal is implemented by that date, the area will reopen to filing of new mining claims and the potential exists for mineral exploration and development.

Relationship of Mineral Withdrawal to the NWM Agreement

The purpose of the NWM Agreement is to protect Yellowstone NP and the surrounding area, other significant natural resources, and the Clarks Fork River from potential adverse effects from the proposed New World Project. The proposed mineral withdrawal would help meet the intent of the NWM Agreement by precluding mineral development on property interests acquired from Crown Butte. Under terms of the NWM Agreement, private surface and subsurface interests and unpatented mining claims controlled by Crown Butte would transfer to federal ownership. In the absence of a mineral withdrawal, property interests acquired under the NWM Agreement, (including unpatented mining claims), may remain available for mineral entry or mineral leasing. For example, lands donated to or purchased by the United States are not available for mining under the General Mining Law of 1872; however, they are available for mineral leasing. Interests acquired by the United States via land exchange may be available under the mining law. If Crown Butte's unpatented mining claims are relinquished and no mineral withdrawal is in place, new mining claims could be filed on these lands. The proposed mineral withdrawal, in concert with the NWM Agreement, ensures that mining would not occur on any acquired properties.

SCOPE OF THE ANALYSIS

This EIS discloses the potential environmental consequences of two alternative strategies for management of federal mineral resources, No Action (no withdrawal) and the Proposed Action (withdrawal). Several additional alternatives were identified during public scoping and were considered but not studied in detail in the EIS. Chapter II, Alternatives, describes why the additional alternatives were not analyzed in detail.

The mineral withdrawal decision focuses on a policy level decision concerning the appropriateness of future mining on federal lands in the area considering other public values present. The broader look at the area differs from the project level analysis used for the NWP. By nature, the project level analysis focuses on alternatives and mitigation designed to resolve resource issues and mitigate the effects of mining.

Project level decisions do not address the larger policy issue of whether mining should occur in this area.

The proposed CCAMW and the NWM Agreement are not considered connected actions in that either action could proceed independent of the decision on the other action (36 CFR 1508.25 (a)(1)). However, the extent of mineral estate withdrawn from mineral entry varies depending upon the status of the NWM Agreement. While the NWM Agreement is a reasonably foreseeable action, there is a clause in the Agreement that allows for cancellation of the Agreement at the end of 6, 12, or 18 months. Therefore, each alternative is evaluated assuming two scenarios - the NWM Agreement **is** implemented, and the NWM Agreement **is not** implemented. This provides for disclosure of the effects of a mineral withdrawal regardless of the outcome of the NWM Agreement. Refer to Chapter 2, Alternatives, for a detailed description of the alternative scenarios.

Along with potential direct and indirect effects, the effects of past, present and reasonably foreseeable future actions also are described in this document. Effects of past and present activities in the area (such as historical mine-related activities that have affected water quality) are represented in the Affected Environment sections of the resource discussions associated with each issue analyzed. Cumulative effects resulting from reasonably foreseeable activities are also summarized for each alternative.

In accordance with NEPA, a preferred alternative is identified as part of this EIS.

DECISIONS TO BE MADE

The authority to withdraw lands from mineral entry lies with the Department of the Interior. The Secretary of the Interior will decide what lands, if any, to withdraw, and for how long. The Secretary is limited to a maximum withdrawal period of 20 years (FLPMA 204 (c)(1)). At the end of the 20 year period, the withdrawal decision will be reviewed to determine if it is appropriate to extend or terminate it. If a withdrawal of more than 5,000 acres is approved, the Secretary of the Interior will immediately advise Congress of the withdrawal action being taken. No action is required by Congress to implement a mineral withdrawal. Congress can terminate a withdrawal with a concurrent resolution from the House and Senate within 90 days of the approval of the Public Land Order.

The Montana State Director, Bureau of Land Management, will submit a recommendation to the Director of the Bureau of Land Management. The recommendation and supporting documentation will then be forwarded to the Secretary of the Interior for a decision. Concurrence on a withdrawal decision by the Secretary of Agriculture is required because lands under consideration for withdrawal are administered by the USDA Forest Service. If the Secretary chooses to implement a withdrawal, a Public Land Order will be filed in the *Federal Register*. The withdrawal would become effective on the date the Federal Register Notice is published in the *Federal Register*.

The affected lands are administered by the Gallatin and Custer National Forests. If the withdrawal is approved, the Secretary of Agriculture would amend Forest Plans to reflect the change in management of locatable and leasable hardrock minerals. The decision on Forest Plan amendments would be concurrent with the Secretary of the Interior's withdrawal decision.

Decisions Beyond the Scope of this Analysis

The original boundary for the proposed withdrawal that was published in the *Federal Register* on September 1, 1995 included National Park lands as well as lands within the A-B Wilderness. These lands are currently withdrawn from mineral entry by statute. Therefore, these areas are excluded from the proposed CCAMW decision.

The proposed mineral withdrawal does not apply to private lands, valid existing rights associated with existing unpatented mining claims; fluid leasable minerals (e.g., oil, gas, geothermal); saleable minerals (sand and gravel); rights-of-way; ingress or egress to existing patented and unpatented mining claims adjacent to or in the vicinity of, the lands to be withdrawn; or any other authorized surface uses on lands under the administration of the Custer and Gallatin National Forests. Decisions regarding future mining on private land or unpatented mining claims with valid existing rights are beyond the scope of this analysis. Such decisions are subject to appropriate state and federal regulations and a separate environmental review process. Other non-mineral related land uses such as logging, hunting, vehicle use, and recreation are not affected by the withdrawal.

A withdrawal decision would not affect a claimant's right to hold and maintain valid, existing unpatented mining claims within the withdrawal area. Unpatented claims require annual payment of a claim maintenance fee to retain rights associated with the mining claim. If annual filings are performed and there is a discovery of a valuable mineral deposit as described under the mining laws, the withdrawal would not affect these rights. However, if either of these conditions are not maintained, rights associated with the unpatented claims would revert to the federal government and the land and minerals would be subject to the terms and conditions of the proposed mineral withdrawal.

Determining the validity of unpatented mining claims, should the mineral withdrawal be approved, is beyond the scope of this analysis. Validity exams are typically conducted when exploration and mining are proposed and resource conflicts are anticipated.

The NWM Agreement provides for acquisition by the U.S. of private minerals and unpatented mining claims held by Crown Butte. The decision to exchange property interests and any subsequent environmental analysis that may be necessary to implement this agreement is beyond the scope of this analysis. However, if any private mineral estate or unpatented mining claims within the boundaries of the proposed withdrawal are acquired by the U.S. as a result of this Agreement, those interests would be subject to the withdrawal. Federal acquisition of private land within the study area is beyond the scope of this analysis

If the NWM Agreement is not implemented, the permitting process for the NWP could resume. The decision to withdraw about 22,000 acres of National Forest land from mineral entry is a separate and distinct decision from approval of a plan of operations or associated permits for the NWP. While they are not considered connected actions, (since either action could be implemented independent of the decision regarding the other), with the proposed mineral withdrawal, three of the eight tailings impoundment site alternatives studied in the NWP Preliminary Draft EIS (PDEIS) would no longer be available for consideration. Refer to the Land Use section in Chapter 3 of this EIS for additional discussion of this subject.

Completion of the New World Project Environmental Analysis is beyond the scope of this analysis. The analysis was halted as a condition of the August 12, 1996 New World Mine Agreement. Crown Butte Mines Inc., the project proponent who was financing the preparation of the EIS, was a party to the Agreement. If the NWM Agreement is terminated, Crown Butte Mines Inc. could reinstate their application and restart the NWP EIS.

Several commentors suggested deferring a decision on the mineral withdrawal until the outcome of the New World Mine Agreement is known. The timing of the withdrawal decision is beyond the scope of this analysis. The Secretary of the Interior has the option of deferring a decision, or selecting a partial withdrawal that retains siting options for future mines. If a withdrawal is not in place by August 31, 1997, the area reopens to location of mining claims. Additional mining claims would likely be located.

The withdrawal does not apply to fluid minerals such as oil and gas. The Custer National Forest has completed the Beartooth Mountains Oil and Gas Leasing EIS (USDA Forest Service, 1993). The Custer National Forest portion of the study area (Stillwater River drainage) is administratively not available for leasing. For the Gallatin National Forest, no decision on the availability for oil and gas leasing has been made. According to the Beartooth Oil and Gas EIS, the oil and gas potential for the area is considered low.

Designation of the area as Wilderness or a National Recreation Area is beyond the scope of this analysis. Such designation requires Congressional action.

Travel management decisions on road, trail and area motorized use within the study area is beyond the scope of this analysis. Such decisions are made at the District or Forest level using appropriate public involvement and environmental documentation (NEPA). Travel management in the area is depicted on the Forest visitor maps for the Custer and Gallatin National Forests.

CONFORMANCE WITH LAWS, POLICIES AND REGULATIONS

The mineral withdrawal EIS is guided by pertinent laws including the National Environmental Policy Act, the Council on Environmental Quality (CEQ) regulations, the Federal Land Policy and Management Act of 1976 (FLPMA), the National Forest Management Act (NFMA), and Mineral Withdrawal regulations at 43 CFR 2310.

The relationship of the mineral withdrawal to other laws, regulations, and policy surfaced during comments on the Draft EIS. The section below expands upon this relationship.

Existing Laws and Regulations - In Chapter 2, Alternatives, the Management Common to All Alternatives sections was expanded to list a summary of key laws and regulations that apply to mineral development on federal land.

Commentors on the draft EIS stated that existing laws and regulations are adequate to protect the environment. The fact that proposed mining projects may comply with existing laws and regulations is an important consideration but not the only deciding factor in a withdrawal decision. A mineral withdrawal decision is a policy decision on future land use in the area. The policy question being addressed is whether mining is an appropriate use of federal lands given other resource values present?

Compliance with National Policy - Policies that address minerals management at the National level include the Forest Service Minerals Program Policy (8/3/85) and the 1995 Draft Resource Planning Act (RPA). The Forest Service Mineral Program policy states:

> "The availability of mineral and energy resources within the National Forest and grasslands significantly affects the development, economic growth, and defense of the nation. The mission of the Forest Service in relation to minerals management is to encourage, facilitate, and administer the orderly exploration, development, and production of mineral and energy resources on National Forest system lands to help meet the present and future needs of the nation."

The mineral withdrawal, if approved by the Secretary of the Interior, is a change in management direction for specific lands within the study area. It does not reflect a change in National policy. The Forest Service Mineral Program policy and the 1995 Draft Resource Planning Act (RPA) program establish policies, goals and objectives applicable to the Nation as a whole, but not necessarily for all lands with the National Forest system.

Wilderness Designation and Congressional Intent - Congressional Reports on the establishment of the Absaroka Beartooth Wilderness recognized the known and potential mineral values of the area. The New World Mining District was listed as high potential area for gold and copper. The area was not included in the Wilderness bill, nor was it withdrawn from mineral entry at that time (1978).

Wilderness designation and mineral withdrawals are two separate and distinct actions with different intent and consequences. Wilderness is designated by Congress under the authority of the 1964 Wilderness Act to preserve areas in a wild and primitive state. Mineral withdrawals are implemented at the discretion of the Administration, or through Congressional action, to withhold areas from mining in order to maintain other resource values present. Congressional action that resulted in establishing the nearby Absaroka Beartooth Wilderness does not preclude or restrict administrative actions such as a mineral withdrawal. Nor does a mineral withdrawal of non-wilderness lands result in future wilderness designation by Congress.

According to the withdrawal regulations at 43 CFR 2310, Congress can review and terminate a mineral withdrawal with a concurrent resolution within 90 days after the public land order is signed.

ISSUES AND CONCERNS

Public Involvement

Issues were identified through scoping meetings and from 190 letters received from individuals, organizations and agencies. From the results of scoping, the lead agencies identified nine issues topics to be addressed in the environmental analysis. Chapter 4, Consultation and Coordination, discusses public involvement activities in greater detail.

Issues

Issues are categorized according to primary resources or topics. For each primary resource or topic, several subissues are addressed. For example, recreation use, wilderness, roadless areas, Wild and Scenic rivers, scenic integrity, and Yellowstone NP are discussed individually as subissues under the heading, "Recreation, Yellowstone National Park, and Special Areas".

Each issue is summarized briefly in the following section. In accordance with NEPA regulations, the lead agencies used these issues as the focus of the EIS.

Water Quality and Quantity - What is the potential for the proposed mineral withdrawal to maintain surface and ground-water quantity and quality?

The headwaters of three drainages - the Clarks Fork, Stillwater River, and Soda Butte Creek - are within the study area. Soda Butte Creek is a tributary to the Lamar River, a major river within Yellowstone NP. Approximately 38 percent of the study area drains into Yellowstone NP. The Clarks Fork is a designated Wild River about 20 miles downstream from the study area. Approximately 36 percent of the study area is within the Clarks Fork drainage. Approximately 26 percent of the study area drains into the Stillwater River. The Clarks Fork and the Stillwater Rivers flow into designated wilderness. All three rivers where they flow through wilderness or Yellowstone NP are designated Outstanding Natural Resource Waters with a water quality standard of non-degradation.

A major concern is the effect of future mining on water quality. Underground or surface mining operations, including ore extraction and storage of tailings within portions of the study area would expose sulfide bearing minerals to water which would increase the potential for acid-rock drainage. Historical mining activities such as ore extraction and disposal of tailings has resulted in increased acid drainage, particularly in Fisher Creek and Daisy Creek. Ground water may be affected if subsurface flows are altered due to surface disturbance or underground mining. Streamflows could also be altered by mining, which could affect downstream water rights.

A mineral withdrawal could reduce the risk of mining-related effects to groundwater or surface water quality and altered streamflows.

Wetlands - What is the potential for the proposed mineral withdrawal to protect and maintain the amount, function, and values of wetlands and waters of the U.S. that could otherwise be affected by mining?

Wetlands, lakes, and streams are common in the study area. Future mining facilities such as access roads, tailings impoundments, and waste rock areas may result in a loss of wetlands or affect their function and value. A mine itself, whether underground or surface, could also effect wetlands. The proposed mineral withdrawal would prevent mineral activities on wetlands in areas withdrawn from mineral entry.

Aquatics - What is the potential for the proposed mineral withdrawal to protect, maintain or improve habitat for fish and other aquatic life that could otherwise be affected by mining?

Mining-related activities may affect habitat for fish and other aquatic life. Potential effects include additional acid drainage, increases in sediment, altered stream flow, temperature changes, or direct loss of aquatic habitat. The proposed mineral withdrawal could reduce the risk of mining related effects on aquatic habitat.

Recreation, Yellowstone NP, and Special Areas - What is the potential for the proposed mineral withdrawal to protect scenic, aesthetic, and recreation values within the study area and in the adjacent Yellowstone NP, A-B Wilderness, the North Absaroka Wilderness, and designated and eligible wild and scenic rivers from the effects of mining?

Many commenters referred to the beauty of the area surrounding Yellowstone NP and the A-B Wilderness. The study area is part of the Beartooth Plateau, a popular area for sightseeing, hiking, backpacking, fishing, hunting, wildlife watching, cross country skiing, and snowmobiling. Several major trails enter the A-B Wilderness from the study area.

The potential effects of future mining on recreation opportunities and scenic integrity is a concern. The mineral withdrawal may help maintain the existing character, settings, recreation experiences, and opportunities. Yellowstone NP borders the study area for three miles. US Highway 212 through Cooke City and Silver Gate is the northeast entrance to the Park. A mineral withdrawal could reduce the potential for mining-related effects to the Park's water quality, air quality, wildlife, and recreation experiences. Future mineral development could affect Park operations due to increased local populations and increased winter access.

The A-B Wilderness borders approximately 12 miles of the proposed withdrawal area on the east, west, and north boundaries. Approximately six miles of the North Absaroka Wilderness in Wyoming borders the southern boundary of the study area. Four roadless areas encompass approximately 60 percent of the study area. Roadless areas include the Beartooth, Republic Mountain, Reef, and the North Absaroka. Future mining could diminish existing opportunities for solitude in nearby wilderness by introducing noise and artificial lighting. Mining claims could be located in roadless areas increasing the potential for future mineral development that could alter the character of the roadless areas.

All streams within the study area form the headwaters of existing or eligible wild and scenic rivers. The Clarks Fork is a designated wild river 20 miles downstream from the study area. The Stillwater River within and downstream from the study area is an eligible river as is Soda Butte Creek in Yellowstone NP.

Land Use - What is the potential for the proposed mineral withdrawal to affect uses of private land, unpatented mining claims, and future mining including the New World Project? How does the mineral withdrawal affect the availability of minerals in the study area?

The study area has high occurrence potential for gold, copper, silver, lead and zinc including proven mineral reserves and sufficient indications that additional mineral resources may be discovered. The area's mining history dates back to the late 1860's. The need for a mineral withdrawal was questioned, particularly when considering existing environmental laws designed to protect resources, and technology available to mitigate mining-related effects. The withdrawal could affect mineral development on private land and on unpatented mining claims on National Forest land by limiting availability of adjacent federal lands for mining-related facilities such as millsites and tailings impoundment. The mineral withdrawal affects several alternatives under consideration for the proposed NWP (in the event the NWM Agreement is not implemented).

Economics - What are the economic implications of the proposed withdrawal?

The study area's economy is strongly influenced by four factors: proximity to Yellowstone NP, limited access and severe winter weather, increasing reliance on recreation and tourism in local and regional economy, and a large share of non-earned income (rather than wages) as a source of resident income. The local and regional economies have been growing in recent years; employment, wages, population, and housing demand have increased. Growth is expected to continue with or without mining. Mining-related jobs are generally higher paying jobs than service sector jobs. A mineral withdrawal could preclude income and employment opportunities that may be provided through mining.

Social - What is the potential for the proposed withdrawal to preclude changes in population, in the need for additional housing and services, and to the overall quality of life that may result from mining?

Changes to the social structure and diversity in the study area could occur due to mining-related development. Concerns about future mining include increase in population, loss of recreation opportunities, increased traffic, shortage of housing, and changes to the overall quality of life. Other local residents support mining for the economic stimulus and improvements to local infrastructure and services that could occur. Those residents of Cooke City/Silver Gate, MT that were surveyed, rated a clean environment, recreation and tourism, low crime rate, and a low growth economy as the four most important economic and social factors. Many people choose to live in this area because of the quality of the natural environment, recreation opportunities, serenity and privacy. The proposed mineral withdrawal may help reduce the potential for mining-related changes to the area.

Cultural - What is the potential for the proposed mineral withdrawal to protect the area's cultural resources that could otherwise be affected by mining?

The study area has been used for mining since the late 1860's. Because it contains many historic mining structures, the area has been listed as the New World Historic District by the National Register of Historic Places. There are 97 cultural resource sites recorded in the study area consisting of 83 historic and 14 prehistoric sites. The proposed mineral withdrawal may help protect cultural resources from future mining-related disturbances.

Wildlife - What is the potential for the proposed mineral withdrawal to protect or maintain wildlife habitat, particularly grizzly bear habitat and populations that could otherwise be affected by mining?

The study area provides spring, summer, and fall habitat for the grizzly bear, a threatened species under the Endangered Species Act. Other threatened or endangered species that may be present include bald eagle, gray wolf, and peregrine falcon. The area also provides summer and fall habitat for elk and mule deer and year-round habitat for moose. A mineral withdrawal may reduce future disturbance and habitat alteration related to mining.

CHAPTER 2
ALTERNATIVES

SUBSTANTIVE CHANGES BETWEEN THE DRAFT EIS AND THE FINAL EIS

The probability of the various Scenarios in Table 2-2 was clarified.

The list of reasonably foreseeable independent activities was expanded to include upgrading the highway between Cooke City, MT and Cody, WY and developing at least one gravel pit in the study area in Table 2-2.

A list of authorities and the general purpose for the various permits, licenses, and approvals required for mining-related activities was added to the section on Management Common to All Alternatives.

Additional alternatives were considered but not analyzed in detail. These are described in the section on Alternatives Eliminated from Detailed Study. An explanation of why they were eliminated from detailed study is also included.

The Comparative Summary of Impacts Table 2-3 was modified for various resources to clarify the summary of impacts and to reflect changes in the description of Environmental Consequences contained in Chapter 3.

INTRODUCTION

This chapter is the "heart" of the EIS (40 CFR 1502.14). It describes two alternatives analyzed in detail as well two Scenarios for each alternative that form the basis of the environmental analysis. Alternative A, the "No Action" Alternative, would not withdraw federal land within the study area from mineral location. Alternative B is the proposed mineral withdrawal of approximately 22,000 acres of federal land.

The alternatives were formulated in response to an application to pursue a mineral withdrawal that was approved by the Secretary of the Interior on August 28, 1995. Following the New World Mine (NWM) Agreement of August 12, 1996, the withdrawal application was amended on September 16, 1996. The amended withdrawal application expanded the scope of the withdrawal to include: 1) an additional 2,960 acres of federal land in the Kersey Lake area; 2) private mineral interests in the area if acquired in the future by the U.S.; and 3) leasable hardrock minerals. The Kersey Lake area was also included in the expanded scope of the withdrawal based on public concerns expressed during the initial stages of scoping.

Formulation of the alternatives was also influenced by input from the public as well as from agencies during the scoping period required by the National Environmental Policy Act of 1969 (NEPA).

The mineral withdrawal decision is a separate and distinct decision from any decisions concerning the NWM Agreement or the previously proposed NWP plan of operations. However, any acquired private land or relinquished unpatented mining claims would be subject to the withdrawal; therefore, the extent of the mineral estate subject to the withdrawal depends on the status of the NWM Agreement. A cancellation clause within the NWM Agreement allows the NWM Agreement to be terminated 6 months, 12 months, or 18 months after the NWM Agreement was signed if certain conditions are not met. Since the outcome of the NWM Agreement may not be known until after completion of this EIS, each alternative is analyzed assuming two Scenarios.

The first Scenario for each alternative assumes the NWM Agreement **is not** implemented; the second Scenario assumes that the NWM Agreement **is** implemented. Each Scenario includes a different set of assumptions consisting of a description of the land available for mining, a mineral development forecast (Appendix B), and identification of other reasonably foreseeable activities in and around the study area. Maps of each Scenario are used to indicate what land would be withdrawn from mineral location and entry as well as to indicate most likely areas of mineral development. These Scenarios form the basis for the environmental impact analysis.

Table 2-1 summarizes the status of the mineral estate for each Scenario. This is included to assist the reader in understanding how much land would remain available for potential future mining with each alternative and Scenario.

Also described in this chapter are management actions and requirements that are common to both alternatives. This is followed by a summary of the environmental consequences presented in a comparative format to illustrate differences

TABLE 2-1 STATUS OF MINERAL ESTATE (acres approximate)

LAND STATUS	ALTERNATIVE A: NO MINERAL WITHDRAWAL		ALTERNATIVE B: PROPOSED MINERAL WITHDRAWAL	
	Scenario A-1: NWM Agreement Not Implemented	Scenario A-2: NWM Agreement Implemented	Scenario B-1: NWM Agreement Not Implemented	Scenario B-2: NWM Agreement Implemented
Federal Lands Subject to the Proposed Mineral Withdrawal	0	0	22,000	22,000
Federal Lands Available for Mining				
Unclaimed	17,760	17,760	0	0
Existing Unpatented Mining Claims Subject to Valid Existing Rights	4,240	4,240	4,240	4,240
Less Unpatented Mining Claims Subject to NWM Agreement	0	(4,180[*])	0	(4,180)
Total Federal Lands Available for Mining	22,000	17,820	4,240	60
Private Lands Available for Mining				
Total Private Lands	4,160	4,160	4,160	4,160
Less Private Lands Subject to NWM Agreement	0	(1,740[*])	0	(1,740)
Remaining Private Lands Available for Mining	4,160	2,420	4,160	2,420
Total Federal and Private Lands Available for Mining	**26,160**	**20,240**	**8,400**	**2,480**

[*] This figure is derived by assuming the mineral estate on these acres would be withdrawn by a separate withdrawal action.

in effects between the alternatives. Identification of the agencys' preferred alternative is based on analysis of impacts in this document.

The last section describes other alternatives that were considered but eliminated from detailed study. This section includes a brief description of those alternatives and explains why they were not analyzed in detail.

ALTERNATIVES STUDIED IN DETAIL

Alternative A: No Mineral Withdrawal (No Action)

This alternative is referred to as the "No Action" Alternative because no action would be taken by the Secretary of the Interior to withdraw the area from mineral location and entry. It would continue the federal minerals management that existed prior to September 1, 1995, when the study area was closed to location of new mining claims for a two-year study period. Under this alternative, federal lands (approximately 22,000 acres) would remain available for mineral exploration and development under the General Mining Law of 1872. Mining claims could be staked for minerals considered to be "locatable" (e.g., gold, copper, silver, lead, zinc, and platinum). These claims would give the locators exclusive possessory rights to the federal mineral deposits subject to conditions under the General Mining Law of 1872 and other applicable statutes.

Exploration and mining for locatable minerals on National Forest System Lands would be subject to the surface management regulations found in 36 CFR 228 Subpart A and other applicable state and federal laws. Surface occupancy and use under the mining laws would be limited to uses reasonably incident to the mining operations. Bonding would be required in accordance with FS and State of Montana policies. All significant disturbances would require filing a plan of operations with the FS and the Montana Department of Environmental Quality (MDEQ) and receiving approval before any surface disturbance work could begin.

The Custer and Gallatin Forest Plans would not be amended regarding mineral location, entry, or recreational mining.

This alternative provides a basis for comparing effects with other alternatives. However, the analysis of Alternative A depends on whether or not the NWM Agreement is implemented.

Scenario A-1 provides a basis for analysis if the NWM Agreement is not implemented. Under this Scenario, 22,000 acres of federal land would remain available for mineral entry. The hypothetical mineral development forecast (Appendix B) addresses the probability of each of 3 mines, and 10 exploratory drilling operations. The forecast assumes the NWP likely would be developed; however, it assumes a lower probability of two additional mines being developed. Mine reclamation, a work camp for each mine, construction of a powerline between Cody, WY and Cooke City, MT, and plowing US Highway 212 east of Cooke City in the winter are also analyzed as mining related activities. Appendix C provides a more complete description of assumptions used as a basis for impact analysis.

Table 2-2 is a summary comparison of alternatives that also displays the different Scenarios analyzed. For Scenario A-1, Map 2-1 highlights the 22,000 acres of federal land that would remain available for mineral location and entry subject to the specific management guidelines and applicable law when the existing segregation expires on August 31, 1997. This map also shows the 4,160 acres of private land that would be available for mining and related activities. Under this Scenario a total of 26,160 acres (22,000 federal and 4,160 private) would remain available for potential future mining.

Scenario A-2, NWM Agreement Implemented, is based on the assumption that the total amount of land available for mining and related activities would be reduced from 26,160 acres to 20,240 acres (17,820 acres of federal land and 2,240 acres of private land). The amount of land available for potential future mineral development would be reduced because it is assumed that an estimated 4,180 acres of federal land with valid existing rights and 1,740 acres of private land controlled by Crown Butte would be withdrawn under a separate withdrawal action when acquired by the federal government as part of the NWM Agreement.

The likelihood of mineral development would be much less than with Scenario A-1 (Table 2-2). The hypothetical mineral development forecast for Scenario A-2 addresses the probability of one mine, and five exploratory drilling operations. Mine reclamation, a work camp for the mine, construction of a powerline between Cody, WY and Cooke City, MT, and plowing US highway 212 east of Cooke City in the winter are analyzed as mining related activities. Appendix C provides a more complete description of assumptions used as a basis for impact analysis for this Scenario.

Map 2-2 highlights the estimated 17,820 acres of federal land that would remain available for mineral location and entry as well as the most likely areas of potential future mineral activities.

Alternative B: Proposed Mineral Withdrawal

Alternative B is the proposed mineral withdrawal. It would not allow individuals to locate new claims for federal hardrock minerals, including any minerals acquired by the federal government in the future. Federal hardrock minerals managed as leasable minerals (those acquired by donation or purchase) would also be withdrawn from future mineral development. With Alternative B, federal minerals on up to 22,000 acres would be withdrawn from location and entry for a period of 20 years. The withdrawal would be subject to review at the end of this time.

Exploration and mining for locatable minerals (including low impact recreational mining activities) and leasable hardrock minerals would be prohibited on federal lands without valid existing rights. On federal lands with valid existing rights, exploration and mining would be managed as described for Alternative A. The proposed mineral withdrawal would not apply to private lands.

The Gallatin and Custer National Forest Land and Resource Management Plans would be amended to be consistent with the terms and conditions of a mineral withdrawal. The Gallatin National Forest Land and Resource Management Plan (GNFFP, 9/87) would be amended to change Management Area 24 (GNFFP, pg III-67), mineral management emphasis, to the surrounding Management Area 15 (GNFFP, pg III-47), which emphasizes dispersed recreation and management for recovery of the grizzly bear. The Custer National Forest Plan Appendix IV and the Gallatin National Forest Plan Appendix D would be amended to include the mineral withdrawal.

The analysis of Alternative B also depends on whether the NWM Agreement is implemented.

Scenario B-1 provides a basis for analyzing Alternative B if the NWM Agreement is not implemented (Table 2-2). Under this Scenario, it is assumed that a total of 8,400 acres (4,240 acres of federal land with valid existing rights and 4,160 acres of private land) would remain available for mining and related activities. An estimated 17,760 acres of federal land would be immediately withdrawn from mineral entry. The hypothetical mineral development forecast addresses the probability of each of three mines and seven exploratory drilling operations. The forecast assumes the

TABLE 2-2 SUMMARY COMPARISON OF ALTERNATIVES

<table>
<tr><th colspan="2">ALTERNATIVE A: NO MINERAL WITHDRAWAL
(NO ACTION)</th><th colspan="2">ALTERNATIVE B: PROPOSED MINERAL WITHDRAWAL
(PREFERRED ALTERNATIVE)</th></tr>
<tr><td colspan="2">Approximately 22,000 acres of federal minerals remain open to mineral location and entry subject to specific management guidelines and applicable law when the existing segregation expires on August 31, 1997.</td><td colspan="2">Approximately 22,000 acres of federal minerals, subject to valid existing rights, would be withdrawn from hardrock mineral location and entry for a period of 20 years. The proposed mineral withdrawal would not apply to private lands. However, lands acquired by the federal government would be subject to the terms and conditions of the withdrawal.</td></tr>
<tr><td colspan="2">Exploration and mining on federal lands would be subject to surface management regulations found in 36 CFR 228 Subpart A and other applicable state and federal laws. Bonding would be required.</td><td colspan="2">Exploration and mining for locatable minerals and leasable hardrock minerals would be prohibited on federal lands without valid existing rights. On federal lands with valid existing rights, exploration and mining would be managed as described for Alternative A.</td></tr>
<tr><td colspan="2">Forest plans would not be amended regarding mineral location, entry, or recreational mining.</td><td colspan="2">Forest plans would be amended as needed to be consistent with the terms and conditions of the mineral withdrawal.</td></tr>
<tr><th colspan="4">BASIS FOR ENVIRONMENTAL IMPACT ANALYSIS</th></tr>
<tr><th>Scenario A-1 NWM Agreement Not Implemented</th><th>Scenario A-2: NWM Agreement Implemented</th><th>Scenario B-1: NWM Agreement Not Implemented</th><th>Scenario B-2: NWM Agreement Implemented</th></tr>
<tr><td>Lands available for mining would amount to 26,160 acres (22,000 acres of federal land remain open to mineral entry and 4,160 acres of private land would be available for mineral development). See Map 2-1.</td><td>Lands available for mining would amount to 20,240 acres (17,820 acres of federal land and 2,420 acres of private land). Interests acquired under the NWM Agreement (4,180 acres of unpatented mining claims and 1,740 acres of private land) would not be available for mining. See Map 2-2.</td><td>Lands available for mining would amount to 8,400 acres (4,240 acres of federal unpatented mining claims and 4,160 acres of private land). 17,760 acres of federal minerals would be immediately withdrawn from mineral entry. Assumes 4,240 acres of federal land with valid existing rights. See Map 2-3.</td><td>Lands available for mining would amount to 2,480 acres (60 acres of unpatented federal mining claims and 2,420 acres of private land). Interests acquired under the NWM Agreement (4,180 acres of federal unpatented mining claims and 1,740 acres of private land) would also be withdrawn. See Map 2-4.</td></tr>
</table>

TABLE 2-2 SUMMARY COMPARISON OF ALTERNATIVES (continued)

<table>
<tr><th colspan="4">BASIS FOR ENVIRONMENTAL IMPACT ANALYSIS</th></tr>
<tr>
<td>Mineral development forecast includes:
-3 Mines (the NWM, another underground mine of similar size [>2 % probability], and a surface mine of similar size [10 % probability])
-10 exploratory drilling operations
- mine reclamation
- a work camp for each mine
- construction of a 69 kV powerline between Cody, WY and Cooke City, MT with 24.9 kV segments to each millsite
- plowing Highway 212 east of Cooke City during the winter, and
- employee residency in surrounding communities

See Map 2-1 for most likely area of development. Most activity would occur on private land.</td>
<td>Mineral development forecast includes:
- 1 Mine (an underground mine [<2 % probability])
- 5 exploratory drilling operations,
- mine reclamation
- a work camp for the mine
- construction of a 69 kV powerline between Cody, WY and Cooke City, MT with 24.9 kV segments to the millsite
- plowing Highway 212 east of Cooke City during the winter
- employee residency in surrounding communities.

See Map 2-2 for most likely area of development. Most activity would occur on federal land.</td>
<td>Mineral development forecast includes:
- 3 mines (the NWM, another underground mine of similar size [<2 % probability], and a surface mine of similar size [<10 % probability])
- 7 exploratory drilling operations,
- mine reclamation
- a work camp for each mine
- construction of a 69 kV powerline between Cody, WY and Cooke City, MT with 24.9 kV segments to each millsite
- plowing Highway 212 east of Cooke City during the winter
- employee residency in surrounding communities

See Map 2-3 for most likely area of development. Most activity would [illegible] on private land.</td>
<td>Mineral development forecast includes:
- No mines
- 1 exploratory drilling operation

See Map 2-4 for most likely area of development. Activity would occur on private land.</td>
</tr>
<tr><td colspan="4">Other reasonably foreseeable independent activities include: Highway construction ([illegible]ce and upgrades between Mammoth and Cooke City); recreation use at Yellowstone NP and surrounding areas would continue to increase; full appropriation [illegible] water rights of Soda Butte Creek drainage will limit development in Cooke City and Silver Gate area; residential development in the study area will continue; upgrade the highway between Cooke City, MT and Cody, WY; develop at least one gravel pit in the study area and mine reclamation.</td></tr>
</table>

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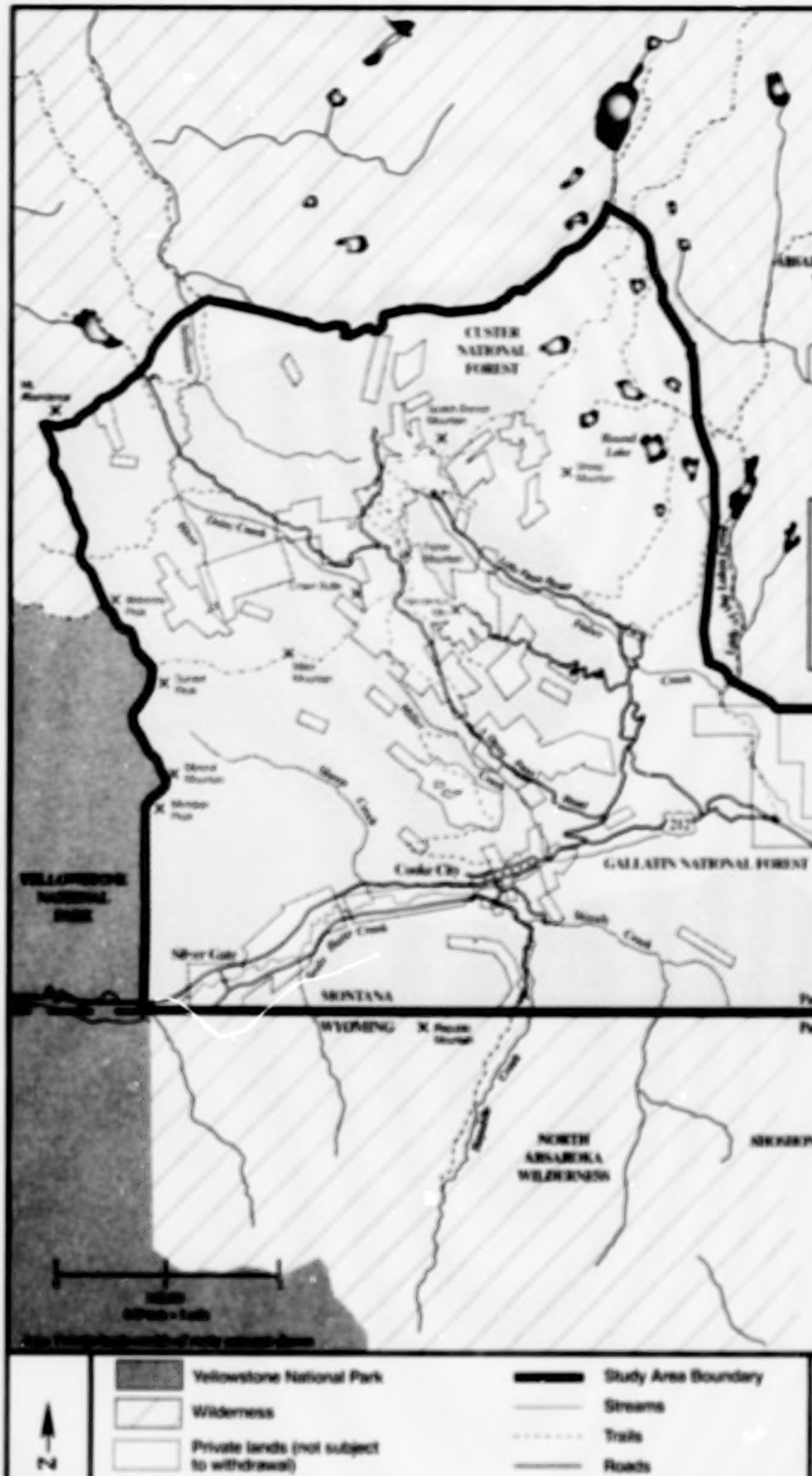
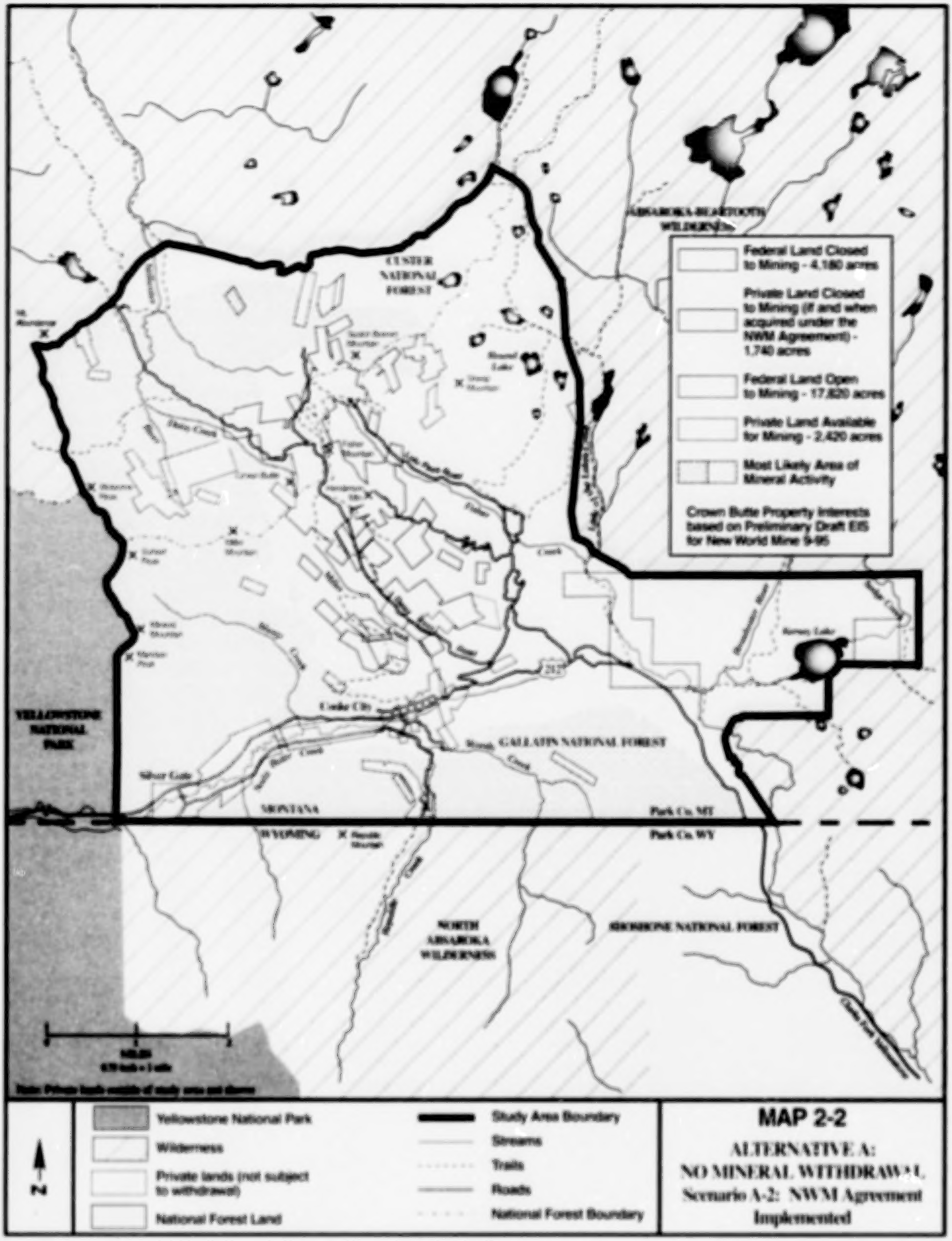

ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Round Lake
Federal Land Open to Mining - 22,000 acres
Private Land - 4,160 acres
Most Likely Area of Mineral Activity
Kersey Lake
212
GALLATIN NATIONAL FOREST
Cooke City
Silver Gate
YELLOWSTONE NATIONAL PARK
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
N
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary

MAP 2-1

ALTERNATIVE A:
NO MINERAL WITHDRAWAL
Scenario A-1: NWM Agreement
Not Implemented


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Federal Land Closed to Mining - 4,180 acres
Private Land Closed to Mining (if and when acquired under the NWM Agreement) - 1,740 acres
Federal Land Open to Mining - 17,820 acres
Private Land Available for Mining - 2,420 acres
Most Likely Area of Mineral Activity
Crown Butte Property Interests based on Preliminary Draft EIS for New World Mine 9-95
Round Lake
Daisy Creek
Fisher Creek
Creek
Miller Creek
Soda Butte Creek
212
Cooke City
Silver Gate
Soda Butte Creek
GALLATIN NATIONAL FOREST
YELLOWSTONE NATIONAL PARK
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
Clarks Fork Yellowstone
0
1
2
MILES
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary
N

MAP 2-2

ALTERNATIVE A:
NO MINERAL WITHDRAWAL
Scenario A-2: NWM Agreement Implemented

NWM would be developed; however, it assumes a lower probability for development of two additional mines. Mine reclamation, a work camp for each mine, construction of a powerline between Cody, WY and Cooke City, MT, and plowing US Highway 212 east of Cooke City in the winter are also analyzed as mining related activities. Appendix C provides a more complete description of assumptions used as a basis for impact analysis.

Map 2-3 highlights the estimated 17,760 acres of federal land that would be withdrawn from mineral location and entry. This map also shows the 4,240 acres of federal land that are assumed to have valid existing rights, and therefore, would remain available for mining and related activities. Under this Scenario a total of 8,400 acres (4,240 acres of federal land with valid existing rights and 4,160 acres of private land) would remain available for mining. It is assumed that most of the mineral development related activities would occur on private lands or on federal lands with valid existing rights.

Scenario B-2. If the NWM Agreement is implemented under Alternative B, the unpatented federal mining claims and private land acquired from Crown Butte would be withdrawn from mineral location and entry. Scenario B-2, NWM Agreement Implemented is based on the assumption that the total amount of land remaining available for potential future mining and related activities would be reduced to about 2,480 acres within the study area. It is estimated that there are about 60 acres of federal land with unpatented mining claims that are not controlled by Crown Butte within the study area. The likelihood of mineral development with this Scenario would be much less than with any of the other Scenarios. The hypothetical mineral development forecast for Scenario B-2 would include no mines and only one potential future exploratory drilling operation.

Map 2-4 highlights the estimated 21,940 acres of federal land that would be withdrawn from mineral location. It also shows the estimated 1,740 acres of private lands that would be closed to mining if and when they were acquired by the federal government under the NWM Agreement.

Management Common to All Alternatives

Mining-related activities on federal lands would be subject to surface management regulations described in 36 CFR Subpart 228 and other state and federal laws. The authorities and the general purpose for the various permits, licenses, and approvals required for mining-related activities are listed below by agency.

Bureau of Land Management

-General Mining Law of 1872: Is the basis for appropriation of hardrock mineral resources on public lands. Essentially all public lands which are not specifically excluded from availability are open and available for mineral exploration and development.

-Mining and Mineral Policy Act of 1970: The purpose is to foster and encourage private enterprise in the "orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals."

Forest Service

-Organic Administration Act: All activities associated with mining must be conducted in accordance with all federal, state, and local laws and regulations governing mining operations and environmental protection.

-Mining and Mineral Policy Act of 1970: Same as Organic Administration Act.

-Surface Management Regulations (36 CFR 228, Subpart A): Allows mineral exploration and development on federal land by incorporating management requirements to minimize or eliminate effects on other resources, to assure compliance with state and federal environmental resource standards and criteria, to coordinate with other governmental agencies, and to ensure all reclamation activities meet appropriate guidelines.

Montana Department of Environmental Quality

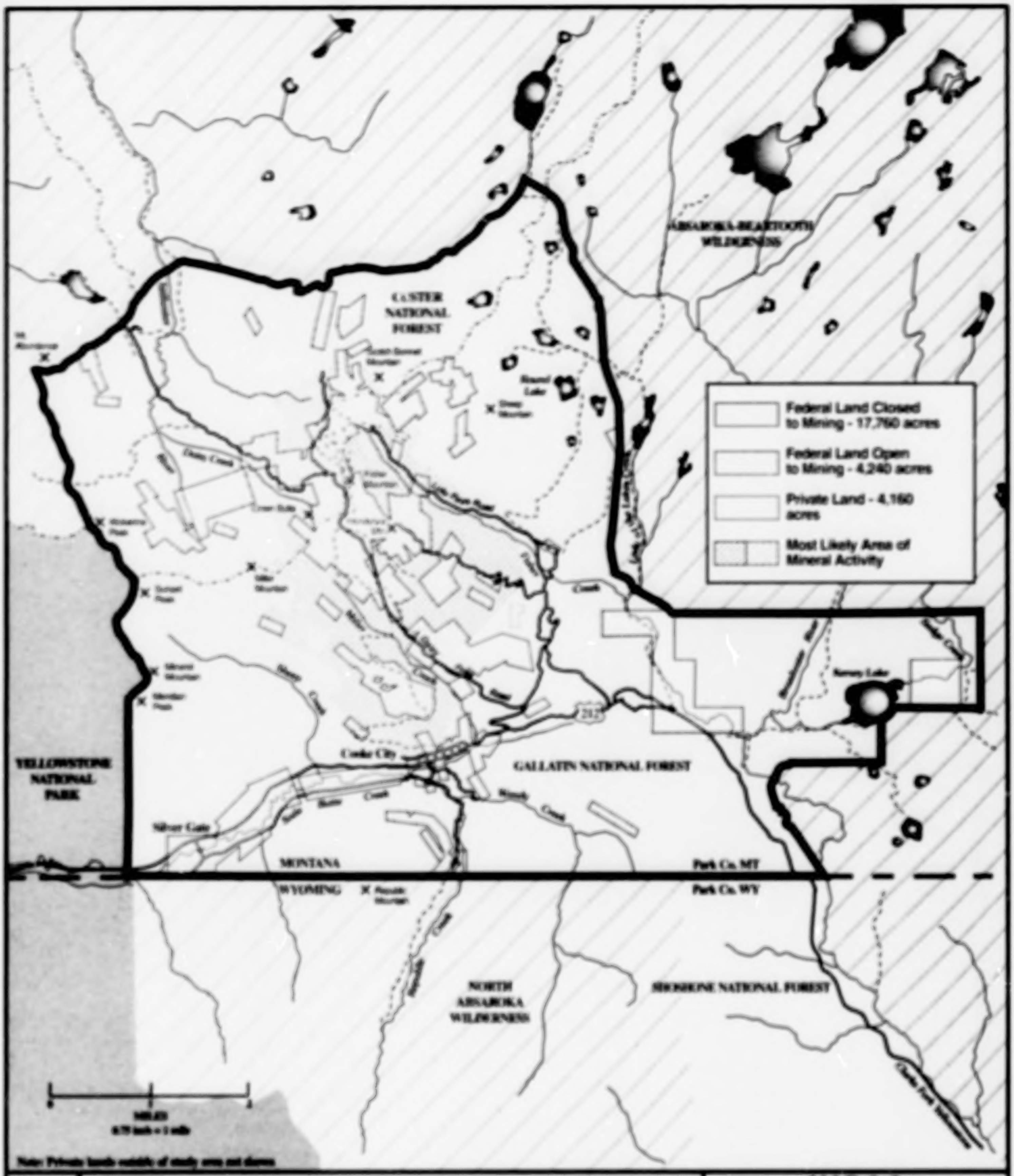
-Montana Mine Reclamation Act, including reclamation bond and monitoring plans: Allows mining while providing for subsequent beneficial use of reclaimed lands, requires sufficient reclamation funding at time of mine closure or abandonment, and assures compliance with state and federal environmental resource standards and criteria.

-Open Cut Permit Act: Allows for the excavation of pits while requiring a reclamation plan and bond.

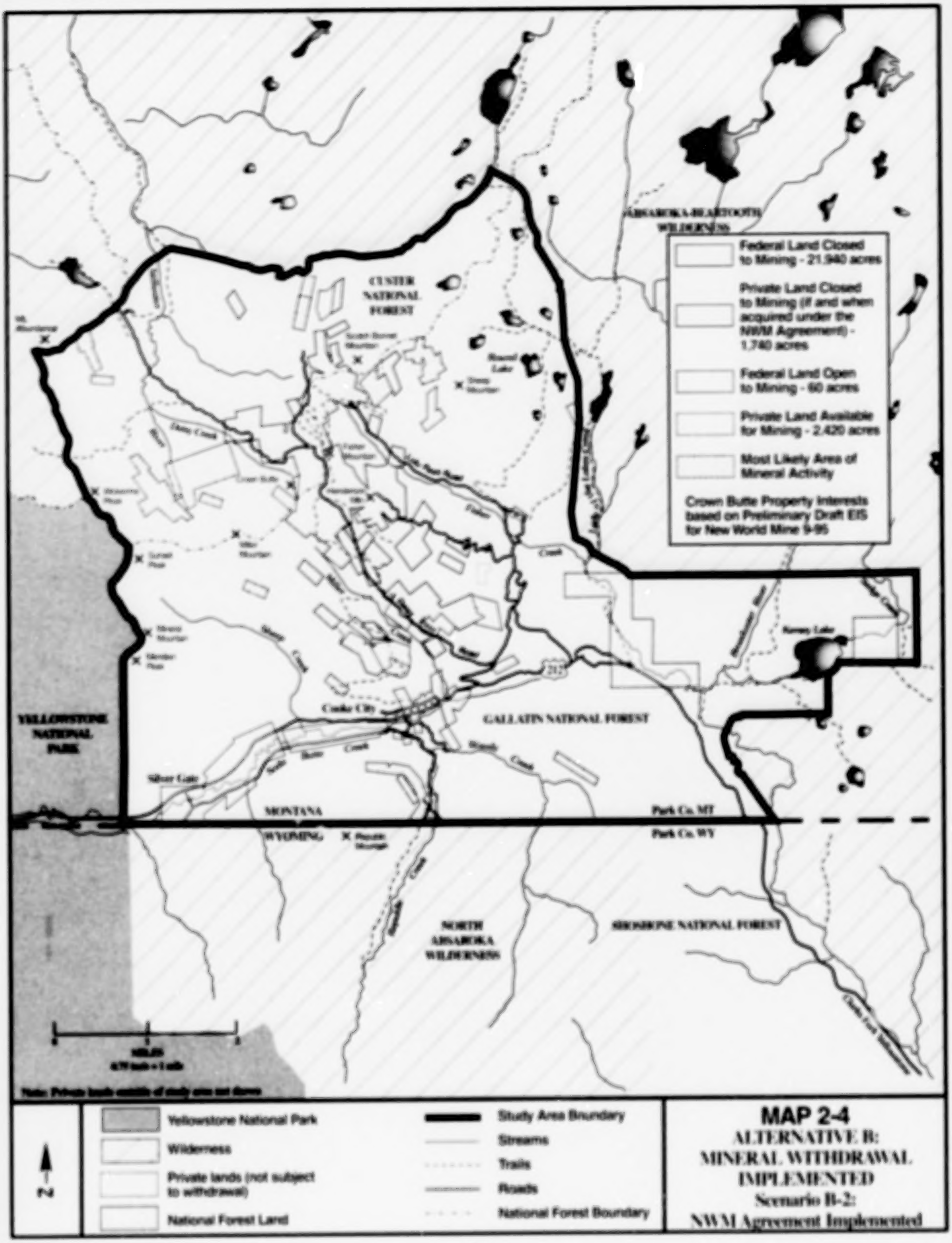
-Montana Clean Air Act: Controls emissions of more than 25 tons per year of particulate matter.

-401 Certification (Sec. 401, Federal Clean Water Act; Administrative Rules for Montana): Required prior to U.S. Corp of Engineers being able to issue a 404 permit; applicable to all federal activities which result in a discharge to state waters.

-Montana Pollution Discharge Elimination System Permit (MPDES): Controls discharge of (including


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Federal Land Closed to Mining - 17,760 acres
Federal Land Open to Mining - 4,240 acres
Private Land - 4,160 acres
Most Likely Area of Mineral Activity
Daisy Creek
Cooke City
Silver Gate
GALLATIN NATIONAL FOREST
Soda Butte Creek
Sheep Creek
Swamp Lake
212
YELLOWSTONE NATIONAL PARK
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
Clarks Fork Yellowstone
MILES
Note: Private lands outside of study area not shown
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary
N

MAP 2-3
ALTERNATIVE B:
MINERAL WITHDRAWAL
IMPLEMENTED
Scenario B-1: NWM Agreement
Not Implemented


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Round Lake
Cooke City
GALLATIN NATIONAL FOREST
YELLOWSTONE NATIONAL PARK
Silver Gate
212
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
Clarks Fork Yellowstone
Daisy Creek
Fisher Creek
Soda Butte Creek
Republic Mountain
Kersey Lake
Federal Land Closed to Mining - 21,940 acres
Private Land Closed to Mining (if and when acquired under the NWM Agreement) - 1,740 acres
Federal Land Open to Mining - 60 acres
Private Land Available for Mining - 2,420 acres
Most Likely Area of Mineral Activity
Crown Butte Property Interests based on Preliminary Draft EIS for New World Mine 9-95
MILES
Note: Private lands outside of study area not shown
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary
N

MAP 2-4
ALTERNATIVE B:
MINERAL WITHDRAWAL IMPLEMENTED
Scenario B-2:
NWM Agreement Implemented

stormwater runoff) to surface waters by setting water quality limitations and requiring self-monitoring.

U.S. Environmental Protection Agency
-Review and approval authority for various programs including 404 permits (Section 309 of the Clean Air Act; Clean Water Act; other environmental statutes).

U.S. Army Corps of Engineers
-Section 404 of the Clean Water Act: controls discharge of dredged or fill material into waters or wetlands of the United States, including intermittent streams.

U.S. Fish and Wildlife Service
-Section 7, Endangered Species Act, Migratory Bird Act: The purpose is to protect and conserve threatened or endangered species by protecting the ecosystem or habitat on which they depend.

Montana State Historic Preservation Office
-Section 106 of the National Historic Preservation Act (36 CFR Part 800): Mitigates impacts on sites eligible for nomination to the National Register of Historic Places.

Montana Department of Environmental Quality
-Montana Water Use Act: Applies if activities would use or extract through surface water diversion or ground water withdrawal, state water in an amount exceeding 100 gallons per minute.

-Montana Metal Mine Reclamation Act: Requires land disturbed by mining to be stabilized and reclaimed to prevent land and surface water degradation.

Montana Department of Commerce, Montana Hard Rock Mining Impact Board and "Affected" Local Government Units
-The Montana Hard-Rock Mining Impact Act: Provides for the mitigation of local government impacts that result from the construction and operation of new large-scale hard-rock mineral development.

-The Property Tax Base Sharing Act: Mitigates impacts to municipalities, counties or school districts in which the mineral development is not located by sharing tax base revenues.

County Conservation Districts
-National Streambed and Land Preservation Act: Provides recommendations and consultation for activities that physically alter the bed or banks of streams.

Unpatented claims (claims where title to the land is held by the federal government, but right of exclusive possession is held by the locator of the mineral deposit) would also require annual improvements or filing of claim maintenance fees. Surface activities on federal lands would be limited to uses reasonably incident to mining operations, i.e. activities such as commercial recreation activities would not be permitted as part of mining operations. Bonding would be required in accordance with Forest Service (FS) and State of Montana regulations. Any significant disturbance would require filing a plan of operations with the FS and the Montana Department of Environmental Quality, and receiving approval before any surface disturbance could begin.

Comparison of Alternatives

Table 2-3 provides a summary comparison of effects for the issues identified in Chapter 1.

Preferred Alternative

Alternative B, Proposed Mineral Withdrawal, is the preferred alternative.

ALTERNATIVES ELIMINATED FROM DETAILED STUDY

The following alternatives were considered but not analyzed in detail for the reasons given below:

Reduce the Size of the Mineral Withdrawal to a Quarter Mile Buffer Adjacent to Yellowstone National Park

This alternative was raised at a scoping meeting but was not analyzed in detail as a separate alternative because it does not meet the purposes stated in the August 28, 1995 Petition for Withdrawal of Federal Lands. The environmental analysis of this alternative would be based on a level of potential development similar to that anticipated for Alternative A. Therefore, the anticipated effects would be essentially the same as those identified for Alternative A.

Expedite Validity Reviews of Existing Claims (Approximately 4,000 Acres) to Help Meet Purpose and Need.

This additional action was offered by the public to expand the scope of the withdrawal to determine the validity of existing unpatented mining claims. Validation of mining claims is a separate and distinct process from a mineral withdrawal and is beyond the scope of this analysis. NEPA analysis is not required for validation of mining claims. This action would provide information concerning validity of existing claims, but it would not, by itself, better meet the purpose and need or result in different environmental consequences. The NWM Agreement also makes this action largely unnecessary since it is estimated that all but approximately 60 acres of unpatented claims are controlled by Crown Butte.

Reduce the Size of the Mineral Withdrawal to Exclude the Area with the Highest Mineral Development Potential (Withdraw Approximately 17,000 Acres).

Essentially, the effects of this alternative are analyzed under Alternative B, No NWM Agreement. Without the NWM Agreement, these minerals remain open to mineral entry due to existing unpatented mining claims and available private property. The status of the mineral estate with the highest mineral development potential depends primarily upon the outcome of the NWM Agreement rather than on this mineral withdrawal.

Extend the Time Period of the Proposed Withdrawal Beyond 20 Years.

This alternative was not analyzed in detail because the length of the withdrawal period is limited by the Federal Land Policy and Management Act of 1976. (Sec. 204 (c)(1)). A withdrawal for a period of time longer than 20 years would require an act of Congress.

Expand the Withdrawal Area to Include the Corridor along the Clarks Fork of the Yellowstone River in Wyoming.

Expanding the proposed mineral withdrawal into Wyoming is beyond the scope of the proposed withdrawal decision. The corridor along the Clarks Fork of the Yellowstone River in Wyoming is beyond the area considered "adjacent to" or "in the vicinity of" the New World Mine area and the New World Mining District. The interpretation for "adjacent to" and "in the vicinity" is defined by the *Federal Register* (September 1, 1995) withdrawal boundary, as well as by the New World Mining District described in the NWM Agreement.

Analyze the Withdrawal of 19,100 Acres of Federal Minerals

This was the size of the initial withdrawal proposal published in the *Federal Register* (September 1, 1995.) As described in Chapter 1 (Proposed Action), the area was expanded in response to concerns raised by the public during scoping and as a result of the NWM Agreement to better meet the purpose and need of this withdrawal.

Alternatives Raised During Comment Review on Draft EIS

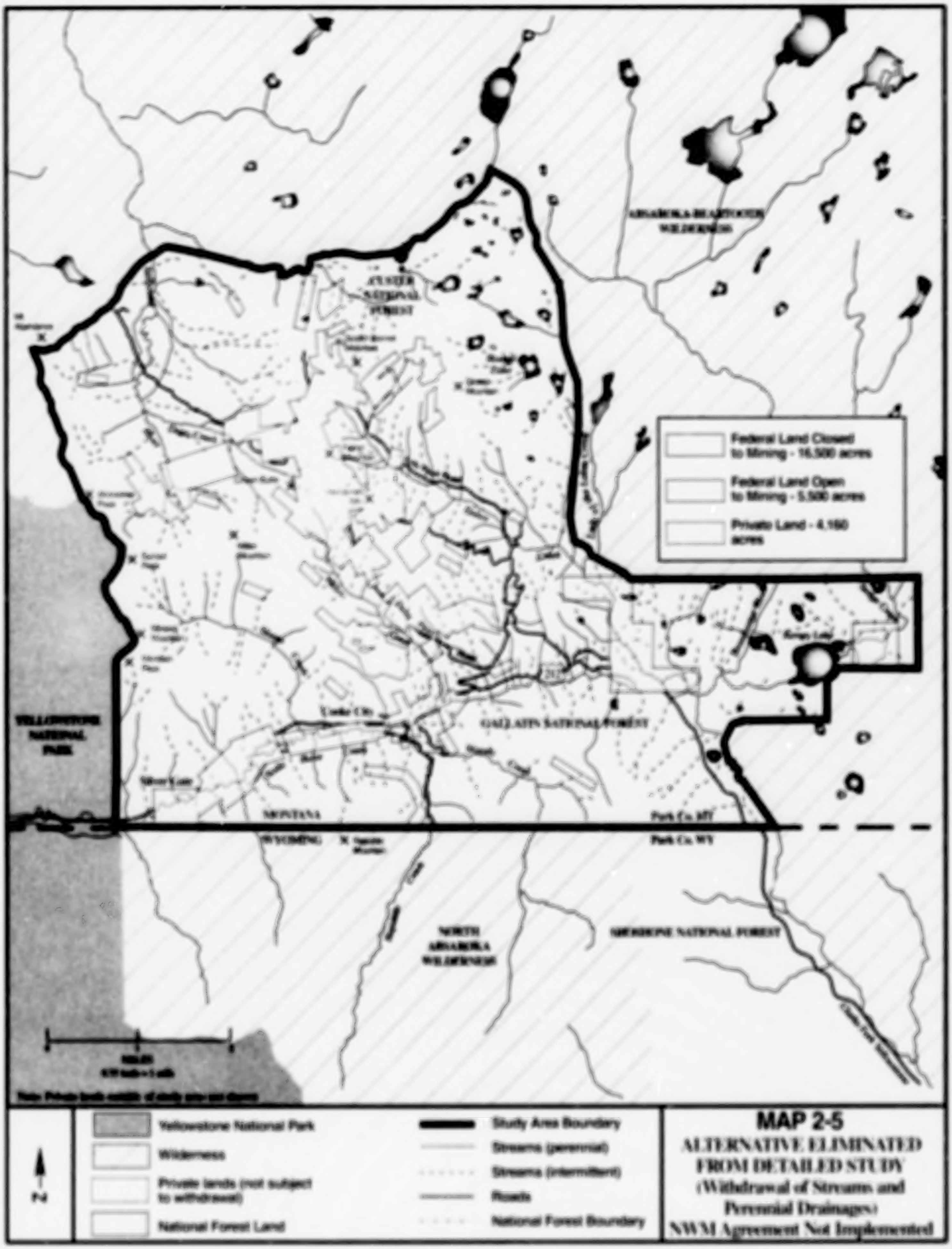
A number of comments received on the Draft EIS suggested consideration of additional alternatives. These alternatives were carefully considered by the interdisciplinary team (IDT), but for the reasons described below, have not been analyzed in detail in the Final EIS (FEIS). Many of these alternatives were mapped to determine what land would be available for mining activities. Mineral development forecasts for the new alternatives were compared to the Scenarios that were analyzed in detail (Scenarios A-1, A-2, B-1, and B-2). The alternatives were not analyzed in detail where the development forecast and impact analysis were anticipated to be similar to those already analyzed. Other alternatives were not analyzed in detail because they either did not provide a basis for analysis or the decision to be made was beyond the scope of this analysis.

Although these alternatives are not evaluated in detail, the Secretary of the Interior could select a "partial" withdrawal alternative such as the ones described below.

Withdraw areas along streams and perennial drainages to form protective corridors (1/4 mile wide along both sides of all live, year round streams and 1/8 mile along both sides of seasonal streams 469).

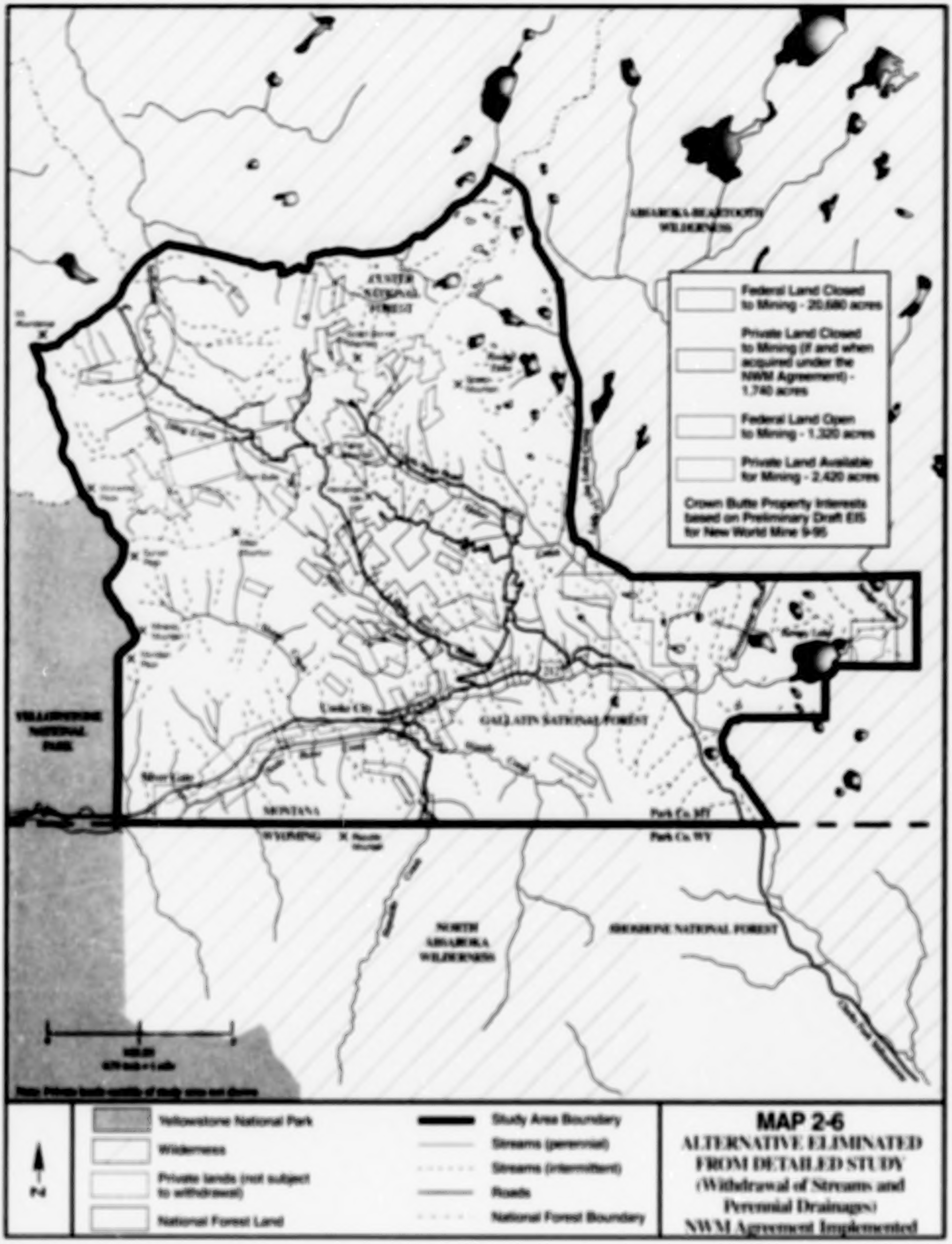
This alternative was not analyzed in detail because, after review by the IDT, it was determined that the anticipated impacts would be similar to those identified for Alternative B. The area withdrawn and the anticipated mineral development would be very similar to what was analyzed in Alternative B. The areas that would be withdrawn under this alternative were mapped (Map 2-5 and Map 2-6) and compared to the areas that would be withdrawn under the two Scenarios of Alternative B (Maps 2-3 and 2-4). Although this alternative would withdraw about 1,260 acres of federal land less than Alternative B, the anticipated mineral development forecast for this alternative would be essentially the same as Alternative B. Under this alternative and Alternative B, the areas of federal and private land open to mining within the areas of highest mineral development potential (See Map 3-11) are very similar. Therefore the impact analysis would also be similar.

In addition, establishing "protective corridors" would not necessarily protect surface water from increased chemical contamination (e.g., acid rock drainage) of ground water that might result from mining. Also, "protective corridors" could force some activities and operations onto steeper slopes with less stable soils which would result in more soil loss, greater sedimentation, and more turbidity.


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Federal Land Closed to Mining - 16,500 acres
Federal Land Open to Mining - 5,500 acres
Private Land - 4,160 acres
YELLOWSTONE NATIONAL PARK
Cooke City
GALLATIN NATIONAL FOREST
Silver Gate
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
MILES
N
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams (perennial)
Streams (intermittent)
Roads
National Forest Boundary

MAP 2-5

ALTERNATIVE ELIMINATED FROM DETAILED STUDY (Withdrawal of Streams and Perennial Drainages) NWM Agreement Not Implemented


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Federal Land Closed to Mining - 20,680 acres
Private Land Closed to Mining (if and when acquired under the NWM Agreement) - 1,740 acres
Federal Land Open to Mining - 1,320 acres
Private Land Available for Mining - 2,420 acres
Crown Butte Property Interests based on Preliminary Draft EIS for New World Mine 9-95
Cooke City
Silver Gate
GALLATIN NATIONAL FOREST
212
YELLOWSTONE NATIONAL PARK
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
MILES
Note: Private lands outside of study area not shown
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams (perennial)
Streams (intermittent)
Roads
National Forest Boundary

MAP 2-6
ALTERNATIVE ELIMINATED FROM DETAILED STUDY
(Withdrawal of Streams and Perennial Drainages)
NWM Agreement Implemented

Establish a non-partisan professional panel to provide independent oversight and quality control of mineral activities of the proposed withdrawal area (469).

While this alternative may address socially and politically contentious proposals, by itself, it does not provide a basis for analysis. In addressing the effects of Alternative A, it was assumed that the regulatory and land management agencies would fulfill their roles of providing quality control to insure that mineral development is carried out in an environmentally sound manner. There is no supportable information to conclude that an independent, non-partisan professional panel would accomplish these tasks more effectively. Therefore, the effects of this alternative would be the same as those provided for Alternative A.

In addition, the Federal Advisory Committee Act requires that before establishing an advisory committee, the federal government must, among other things, determine that the functions of the committee could not be performed by an existing committee or by one or more federal agencies. Both the BLM and the FS provide oversight and quality control of mineral activities within the study area.

Finally, if the Secretary of the Interior chooses not to withdraw all or a portion of the study area, the FS will continue to pursue an open, collaborative planning process with the public for activities that occur on these federal lands.

Withdraw areas along streams to establish protective corridors and establish a nonpartisan panel to provide oversight (469).

This was not analyzed in detail for the same reasons as described for the previous two alternatives.

Withdraw only those areas which are (1) within the areas of highest potential for mineral development, and (2) outside of the areas of federal land which might be used for the New World Project (505).

Nearly all of the "areas of highest potential for mineral development" (Map 3-11) are either privately owned or leased by Crown Butte or they are unpatented mining claims owned or leased by Crown Butte (Map 3-13). Therefore, very little federal land with the "highest potential for mineral development" would be considered "outside of the areas of federal land which might be used for the New World Project". Since little or no land would be withdrawn, the effects would be the same as those analyzed for Alternative A.

Emphasize reclamation of historic mining activities rather than the frustration of future mining opportunities (505).

Future reclamation is beyond the scope of the mineral withdrawal analysis. However, reclamation is considered under both Alternatives A and B, especially under Scenarios A-2 and B-2. (See Appendix C).

Withdraw that portion of the study area that drains into Yellowstone National Park via the Soda Butte Creek drainage, along with a logically derived buffer strip along the boundary to Yellowstone National Park (506).

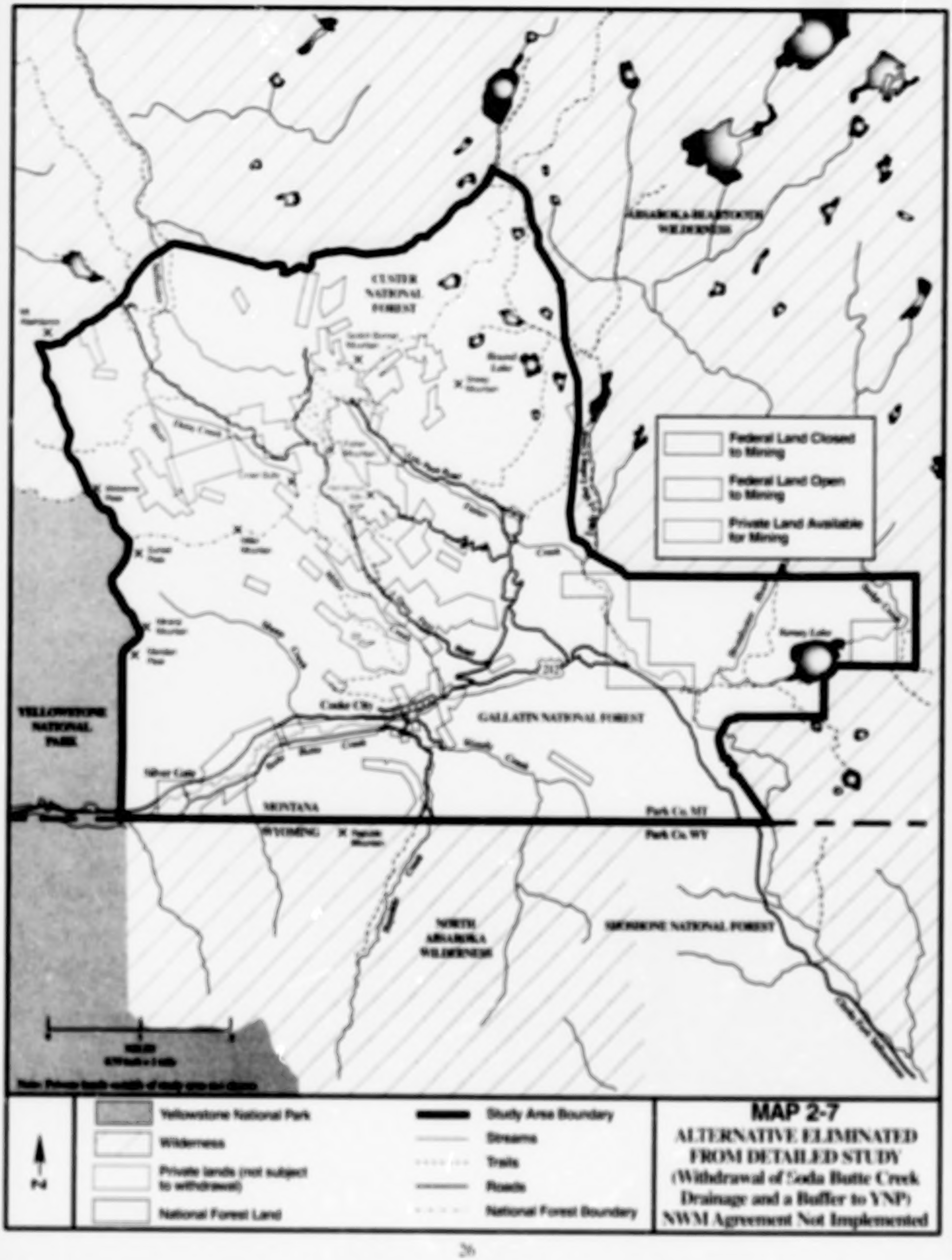
This alternative was not analyzed in detail because the anticipated impacts would be similar to those identified for Alternative B. The areas that would be withdrawn under this alternative were mapped (Map 2-7 and 2-8). The most likely areas of mineral activity were also compared between this alternative and the Scenarios analyzed in detail. Under this alternative and Alternative B, the areas of federal and private land open for mining within the areas of highest mineral development potential (Map 3-11) are very similar. Based on that comparison, it was determined that the most likely areas of mineral activity in this alternative were similar to the most likely areas of mineral activity for Alternative B. Therefore, the anticipated mineral development forecast for this alternative would be essentially the same as with Alternative B. Finally, the impact analysis for both Scenarios would also be similar to Scenarios already analyzed in detail for Alternative B.

This alternative also does not meet the stated purpose and need for protecting water quality and fresh water fishery resources within the watersheds of Clarks Fork of the Yellowstone River or the Stillwater River. It also does not meet the other reasons identified during scoping for a withdrawal, i.e. protecting surrounding wilderness areas, scenic integrity, recreation opportunities, cultural resources, and wildlife from mining activities in the Clarks Fork drainage and the Stillwater drainage.

Finally, this alternative may not prevent impacts to water quality and other resources or values within the Soda Butte Creek drainage from underground mining and acid rock drainage. For example, portions of the New World Project would be underground within the Miller Creek drainage which is part of the Soda Butte Creek drainage.

Withdraw watersheds and drainages naturally capable of producing or sustaining a fresh water fishery resource, and those watersheds and drainages naturally capable of producing water year round in sufficient quality and quantity to support a fishery resource (507).

Withdraw those watersheds and drainages naturally capable of producing or sustaining a fresh water fishery resource, and those watersheds and drainages naturally capable of producing water year round in sufficient quality and quantity to support a fishery resource, and

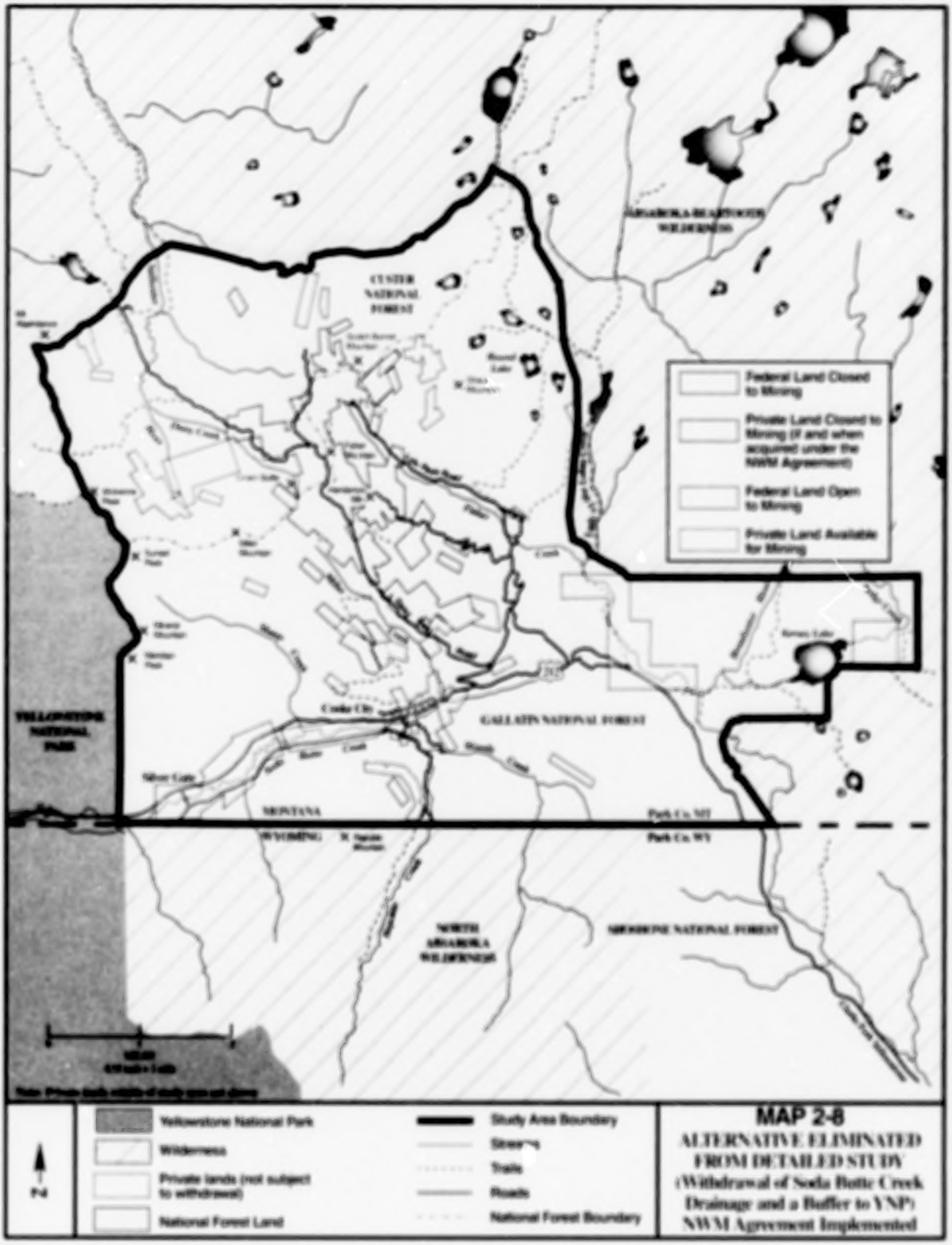


MAP 2-7

ALTERNATIVE ELIMINATED FROM DETAILED STUDY

(Withdrawal of Soda Butte Creek Drainage and a Buffer to YNP)

NWM Agreement Not Implemented


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Round Lake
Federal Land Closed to Mining
Private Land Closed to Mining (if and when acquired under the NWM Agreement)
Federal Land Open to Mining
Private Land Available for Mining
Daisy Pass
Cooke City
212
GALLATIN NATIONAL FOREST
Silver Gate
YELLOWSTONE NATIONAL PARK
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
Clarks Fork Yellowstone
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary
N

MAP 2-8

ALTERNATIVE ELIMINATED FROM DETAILED STUDY
(Withdrawal of Soda Butte Creek Drainage and a Buffer to YNP)
NWM Agreement Implemented

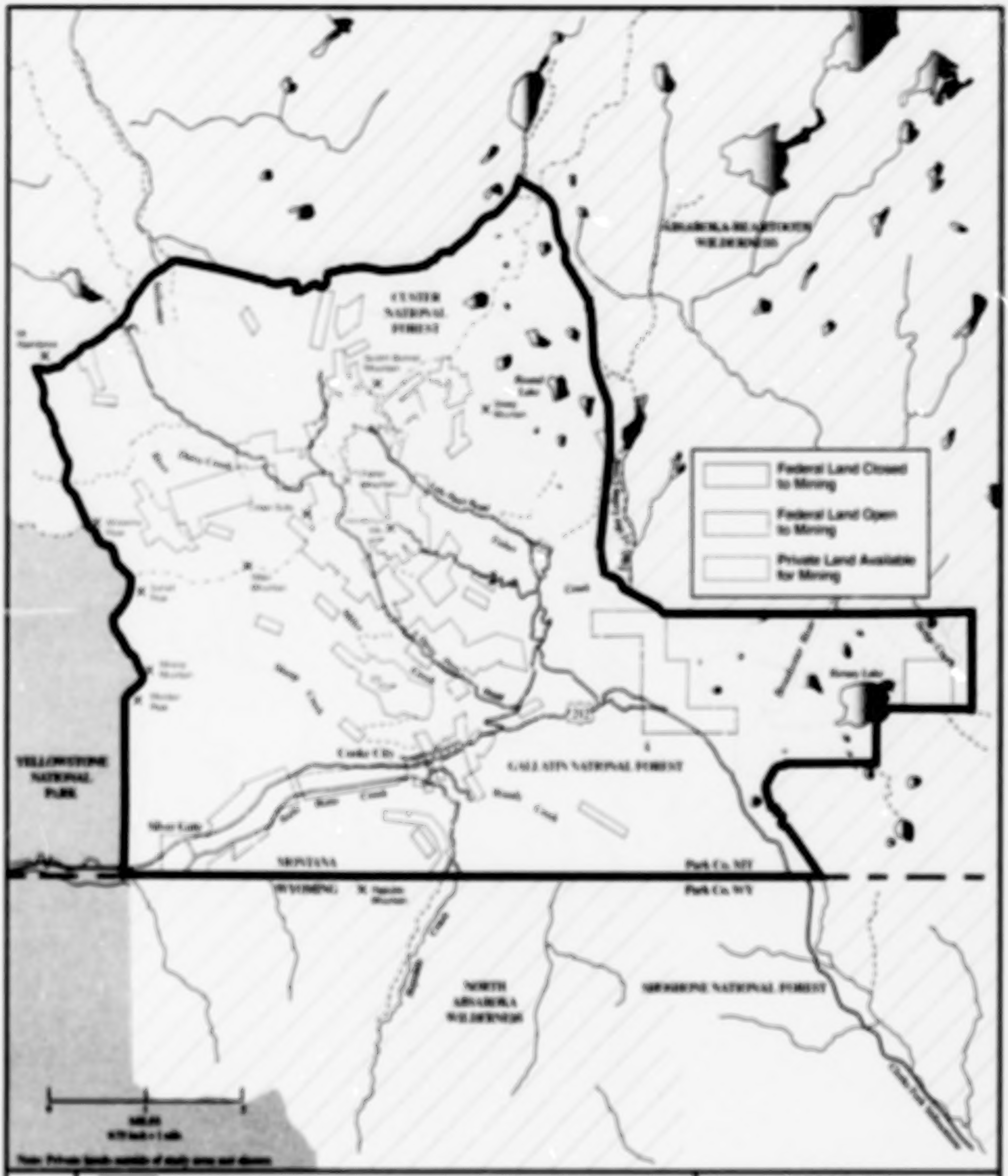
withdraw 250' along both sides of streams and perennial drainages in the remaining watersheds and drainages forming protective corridors and natural buffer zones (507).

Both of these alternatives would result in similar effects. Neither was analyzed in detail because the anticipated impacts would also be similar to those identified for Alternative B. The areas that would be withdrawn under these alternatives were mapped (Map 2-9 and Map 2-10). After careful consideration of the areas that would be withdrawn from mineral location and entry, it was concluded that the areas of federal and private land open to mining within the areas of highest mineral development potential (Map 3-11) would be very similar to what would be available with Alternative B. Therefore, the mineral development forecast and the impact analysis would also be similar to Alternative B.

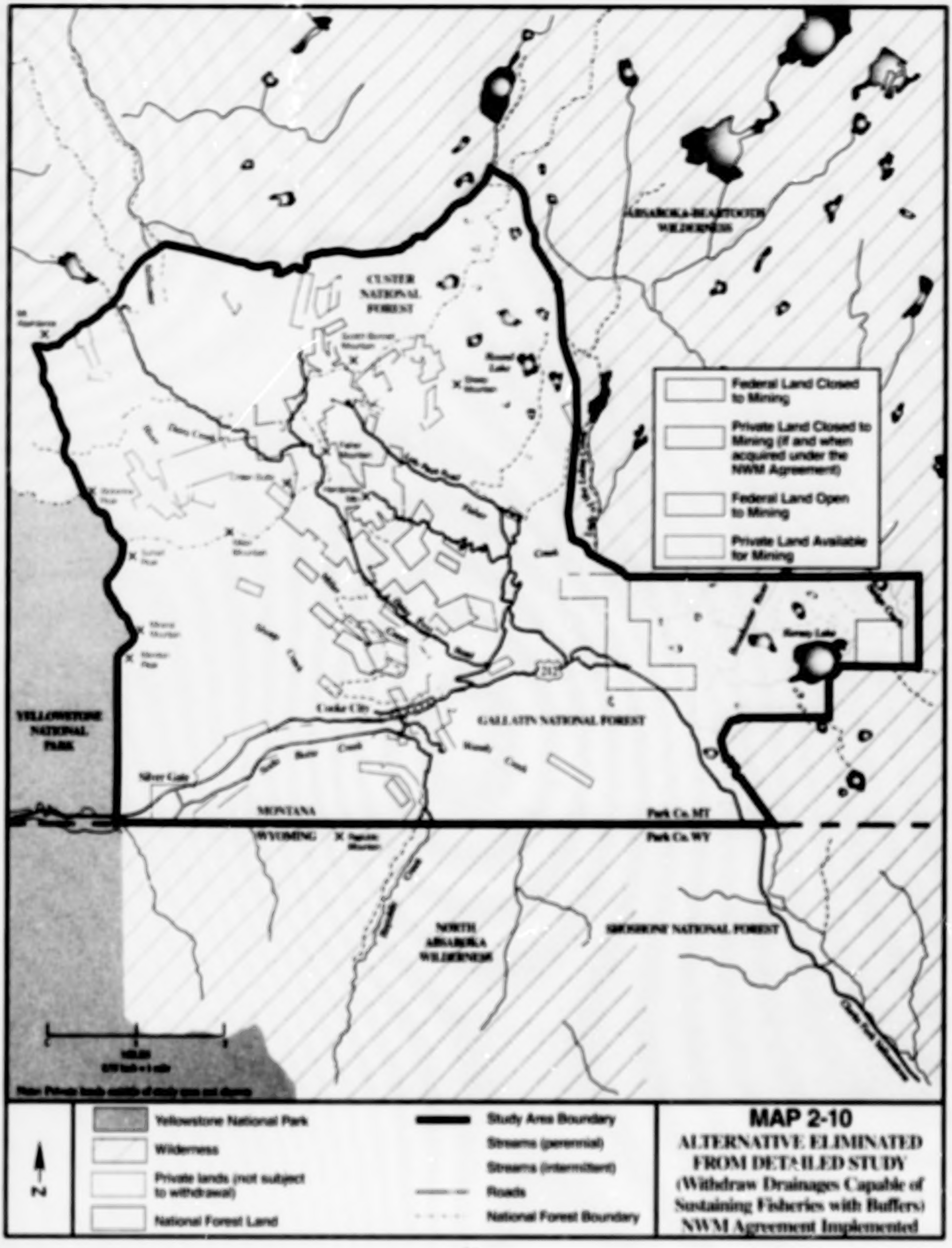
Also, a 250 foot setback of surface disturbing activities from streams and water supporting fish would not necessarily protect surface water from increased chemical contamination (e.g., acid rock drainage) of ground water that might result from mining. A 250 foot setback of surface disturbing activities from streams and water may also force some activities and operations onto steeper slopes with less stable soils which could result in more soil loss, greater sedimentation, and more turbidity.

Defer the withdrawal decision until all uncertainties associated with the NWM Agreement are resolved and the NWM Agreement is implemented (505, 474).

This was not analyzed in detail as a separate alternative because this would be a decision beyond the scope of this analysis. The timing of a withdrawal decision would not change the impact analysis contained in this document.


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Round Lake
Federal Land Closed to Mining
Federal Land Open to Mining
Private Land Available for Mining
Creek
Cooke City
GALLATIN NATIONAL FOREST
212
YELLOWSTONE NATIONAL PARK
Silver Gate
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
MILES
Note: Private lands outside of study area not shown
N
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams (perennial)
Streams (intermittent)
Roads
National Forest Boundary

MAP 2-9
ALTERNATIVE ELIMINATED FROM DETAILED STUDY
(Withdraw Drainages Capable of Sustaining Fisheries with Buffers)
NWM Agreement Not Implemented


Federal Land Closed to Mining
Private Land Closed to Mining (if and when acquired under the NWM Agreement)
Federal Land Open to Mining
Private Land Available for Mining
ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Round Lake
Daisy Creek
Fisher Creek
Cooke City
Silver Gate
Soda Butte Creek
212
GALLATIN NATIONAL FOREST
YELLOWSTONE NATIONAL PARK
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
0
1
2
MILES
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams (perennial)
Streams (intermittent)
Roads
National Forest Boundary
N

MAP 2-10
ALTERNATIVE ELIMINATED FROM DETAILED STUDY (Withdraw Drainages Capable of Sustaining Fisheries with Buffers) NWM Agreement Implemented

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PAGE

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS

<table>
<tr><th>Alternative A,
No Mineral Withdrawal
Scenario A-1: NWM
Agreement Not Implemented</th><th>Alternative A,
No Mineral Withdrawal
Scenario A-2: NWM
Agreement Implemented</th><th>Alternative B,
Mineral Withdrawal Implemented
Scenario B-1: NWM
Agreement Not Implemented</th><th>Alternative B,
Mineral Withdrawal Implemented
Scenario B-2: NWM
Agreement Implemented</th></tr>
<tr><td colspan="4">Surface and Ground Water, Wetlands, and Floodplains</td></tr>
<tr><td colspan="3">Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining could result in stream flow reduction and degraded ground-water quality. Changes in ground water would also affect surface water quality where water emerges in streams, springs, or seeps. Mining-related risks to water resources in this area include the potential for increased acid-rock drainage, the potential for ground-water contamination from underground mines, potential for failure of tailings impoundments, and uncertainty of mitigating effects to wetlands (Appendix H, Failure Modes Effects Analysis). Surface water quality would be closely regulated with MPDES permits for point discharges and storm water permits for non-point discharges in order to meet water quality standards and non-degradation requirements. Mining could also result in the filling of wetlands and floodplains within the study area which has very limited availability of wetland mitigation sites. Impacts to wetlands caused by streamflow reductions and degraded groundwater quality may occur. Wetland impact analysis requires the delineation and mapping of all potentially affected wetlands and non-wetland waters of the US, a determination of their functions, a rigorous exploration of alternatives that avoid and minimize impacts, and an investigation of ways to mitigate unavoidable impacts. Some wetland losses, such as fens, cannot be recreated.</td><td rowspan="2">Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on surface and ground-water quality, wetlands, and floodplains would not be anticipated from mining.</td></tr>
<tr><td>Potential for impacts on surface and ground-water quality, wetlands, and floodplains would be greatest with the mining activities forecast in this Scenario. Impacts could occur on all three major drainages.</td><td>Potential for impacts on surface and ground-water quality, wetlands, and floodplains from mining activities would be much less than with Scenario A-1. Impacts may occur in either Stillwater or Soda Butte Creek drainage if a mine is developed.</td><td>Potential for impacts on surface and ground-water quality, wetlands, and floodplains from mining would be similar to Scenario A-1. Mining would not occur on streams, wetlands, and floodplains on 17,760 acres withdrawn; however, mining of adjacent areas could affect the streams, wetlands and floodplains withdrawn from mineral entry. Some NWM facility sites would be withdrawn; remaining available locations may increase the risk to water quality and wetlands compared to Scenario A-1.</td></tr>
</table>

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

<table>
<tr>
<th>Alternative A,
No Mineral Withdrawal
Scenario A-1: NWM
Agreement Not Implemented</th>
<th>Alternative A,
No Mineral Withdrawal
Scenario A-2: NWM
Agreement Implemented</th>
<th>Alternative B,
Mineral Withdrawal Implemented
Scenario B-1: NWM
Agreement Not Implemented</th>
<th>Alternative B,
Mineral Withdrawal Implemented
Scenario B-2: NWM
Agreement Implemented</th>
</tr>
<tr>
<td colspan="4">Aquatic Resources</td>
</tr>
<tr>
<td colspan="3">Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining could affect fish and other aquatic life by reducing streamflow, increasing sedimentation, and changing water quality. These changes in some streams, e.g. Upper Fisher Creek and Daisy Creek, would have minimal effect on aquatic habitat and biota because they are already severely impaired from historic mining. Degradation of comparatively healthy streams, e.g. Miller Creek, the Broadwater and Clarks Fork Rivers, and Soda Butte Creek, would be more significant.</td>
<td rowspan="2">Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on fish and other acquatic life would not be anticipated from mining.</td>
</tr>
<tr>
<td>Potential for impacts on fish and aquatic life from mining would be greatest with this Scenario. Impacts could occur on all three major drainages.</td>
<td>Potential for impacts on fish and aquatic life from mining would be much less than with Scenario A-1. Impacts may occur in streams in either Stillwater or Soda Butte Creek drainage if a mine is developed.</td>
<td>Potential for impacts on fish and aquatic life from mining would be similar to Scenario A-1. Impacts could originate on private land or federal land with valid claims on any of the three major drainages. Some NWM facility sites would be withdrawn; remaining available locations may increase the risk to aquatics compared to Scenario A-1.</td>
</tr>
</table>

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Recreation and Scenic Integrity			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining activities would change the recreation setting, recreation experiences, level of recreation use, and scenic integrity of the area. Mining would likely change recreation settings in semi-primitive areas to a roaded natural setting. Changes in noise, lighting, traffic, and local population caused by mining are also likely to change the recreation experiences. Overall recreation use would not be expected to change even though users seeking solitude and natural environments may be displaced. Improved local access roads, winter access, and increases in local population would increase use. Mining would likely change scenic integrity levels in areas of very high, high or moderate scenic integrity to lower levels. Depending on the location, mining related activities could be visible from wilderness areas or Yellowstone NP.			Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential mining-related impacts on recreation setting, recreation experiences, level of recreation use, and scenic integrity of the area would not be anticipated.
Potential for impacts on recreation setting, recreation experiences, recreation use and scenic integrity from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. Impacts would be most likely in the Lulu/Daisy Pass, 212 Corridor, Sheep Creek, Upper Stillwater, and Woody Creek recreation settings. Near mine locations, scenic integrity would change from moderate to low or very low levels.	Potential for impacts on recreation setting, recreation experiences, recreation use and scenic integrity from mining forecast under this Scenario would be much less than under Scenario A-1. Impacts would be most likely outside the Lulu/Daisy Pass recreation settings. The remaining federal lands open to mineral entry have high to very high scenic integrity levels. If mining occurs, scenic integrity levels would likely drop depending upon size and location of mineral activity.	Potential for impacts on recreation setting, recreation experiences, recreation use and scenic integrity from mining activities would be similar to Scenario A-1, but these impacts would most likely occur in the Lulu/Daisy Pass recreation settings. Semi-primitive recreation setting and opportunities on 17,760 acres would be maintained. Scenic integrity would not be affected by mining on 17,760 acres withdrawn.	

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A. No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A. No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B. Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B. Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Yellowstone National Park			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining in the study area could increase the need for staff, housing, road maintenance, and other services within the Park due to additional winter access and increased local population in the Cooke City/Silver Gate area. Park visitation would also increase at the NE entrance of Yellowstone NP if the highway between Cooke City, MT and Cody, WY is open all winter. Backcountry visitor experiences in the NE portion of the Park near the Park boundary could be affected by noise, night lighting, and other visual impacts. Mining could degrade water quality and reduce quantity in Soda Butte Creek which flows into the Park. Mining could continue as one of the identified threats that caused the World Heritage Committee to include Yellowstone NP on a list of World Heritage Sites in Danger. Mining would not affect the Park's Biohpere Reserve designation. Backcountry visitors near the study area could experience high noise levels, more night lighting, and altered landscapes.			Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential for impacts on Park operations, Park visitation, visitor experiences, and World Heritage Site designation from mining related activities would not be anticipated.
Potential for impacts on Park operations, Park visitation, visitor experiences, and World Heritage Site designation from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. Lands adjacent to Yellowstone NP would remain available for mineral entry.	Potential for impacts on Park operations, Park visitation, visitor experiences, and World Heritage Site designation from mining forecast under this Scenario would be much less than under Scenario A-1. Lands adjacent to Yellowstone NP would remain available for mineral entry.	Potential for impacts on Park operations, Park visitation, visitor experiences, and World Heritage Site designation from mining activities would be similar to Scenario A-1. Lands adjacent to Yellowstone NP would be withdrawn from mineral entry.	

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

<table>
<tr><th>Alternative A.
No Mineral Withdrawal
Scenario A-1: NWM
Agreement Not Implemented</th><th>Alternative A.
No Mineral Withdrawal
Scenario A-2: NWM
Agreement Implemented</th><th>Alternative B.
Mineral Withdrawal Implemented
Scenario B-1: NWM
Agreement Not Implemented</th><th>Alternative B.
Mineral Withdrawal Implemented
Scenario B-2: NWM
Agreement Implemented</th></tr>
<tr><td colspan="4">Wilderness</td></tr>
<tr><td colspan="3">Mining-related effects would vary by Scenario, based on probability of mineral development. Noise, night lighting, and increased population associated with mining development could change the solitude, natural integrity, and primitive recreation experience available in wilderness areas surrounding the study area. Changes in nearby human activity, noise, dust, wilderness water quality, and night lighting caused by mining would also likely change the primitive recreation experience. Users seeking solitude and natural environments may be displaced. Effects would depend upon the location and size of future mines. Generally, effects diminish as you move deeper into the wilderness. Natural integrity could be influenced if wilderness water quality is degraded. The risks of mining-related water quality degradation are summarized in Appendix H, Failure Modes Effects Analysis.</td><td rowspan="2">Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. The withdrawal would not alter the solitude, natural integrity, and primitive recreation opportunities.</td></tr>
<tr><td>Potential for impacts on solitude, natural integrity, and primitive recreation from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. Impacts would be most likely in Absaroka-Beartooth Wilderness west and north of the study area. Lands adjacent to wilderness would remain available for mineral entry. Mining could affect water quality of the Clarks Fork and Stillwater rivers; both rivers flow into the Absaroka-Beartooth Wilderness.</td><td>Potential for impacts on solitude, natural integrity, and primitive recreation from mining forecast under this Scenario would be much less than under Scenario A-1. Impacts would also be less likely in the Clarks Fork watershed due to the NWM Agreement. Lands next to wilderness would remain available for mineral entry.</td><td>Potential for impacts on solitude, natural integrity, and primitive recreation from mining activities would be less than with Scenario A-1 because mining would be concentrated in the center of the study area. Although 17,760 acres of federal land adjacent to wilderness would be unavailable for mining related activities, mining could affect water quality in the Clarks Fork and Stillwater Rivers which flow into the A-B Wilderness.</td></tr>
</table>

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

<table>
<tr><th>Alternative A,
No Mineral Withdrawal
Scenario A-1: NWM
Agreement Not Implemented</th><th>Alternative A,
No Mineral Withdrawal
Scenario A-2: NWM
Agreement Implemented</th><th>Alternative B,
Mineral Withdrawal Implemented
Scenario B-1: NWM
Agreement Not Implemented</th><th>Alternative B,
Mineral Withdrawal Implemented
Scenario B-2: NWM
Agreement Implemented</th></tr>
<tr><td colspan="4">Roadless Areas</td></tr>
<tr><td colspan="3">Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities could change the natural integrity and apparent naturalness, the remoteness and solitude, and the manageability and boundaries of roadless areas. The actual effects would depend upon the size and location of future mining activity.</td><td rowspan="2">Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on natural integrity, apparent naturalness, remoteness, solitude, manageability, and boundaries of roadless areas withdrawn from mineral entry would not be anticipated from mining. Roadless areas are not available for mineral entry.</td></tr>
<tr><td>Potential for impacts on natural integrity and apparent naturalness, remoteness and solitude, and the manageability and boundaries of four roadless areas from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. NWP may reduce the size of the Beartooth Roadless Area (RA). All roadless areas remain available for mineral entry.</td><td>Potential for impacts on natural integrity and apparent naturalness, remoteness and solitude, and the manageability and boundaries of three roadless areas from mining forecast under this Scenario would be much less than under Scenario A-1. The Beartooth RA probably would not be affected. Roadless areas would remain available for mineral entry.</td><td>Reef, Republic Mountain, and most of N. Absaroka and Beartooth RAs would be withdrawn from mineral entry. Effects from mining in the central portion of the study area could affect the feelings of remoteness and solitude of these areas. The NWP may reduce the size of the Beartooth RA.</td></tr>
</table>

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Wild & Scenic Rivers			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities could change water quality, and outstandingly remarkable values of certain Wild and Scenic river segments. Most eligible or designated Wild and Scenic river segments are outside the study area. Mining upstream could degrade water quality if there are mine facility failures or ground-water contamination. The potential effects of future mining on designated and eligible Wild and Scenic River segments depends upon the location, size and operational success of future mines. If future mines affect the outstandingly remarkable values, (scenic, recreational, geologic, fish and wildlife, historical, and cultural) or the characteristics (free of impoundments, inaccessible except by trail, essentially primitive shorelines, unpolluted waters) of eligible Wild and Scenic Rivers, the rivers may no longer be eligible for designation.			Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on water quality, free-flowing segments, and outstandingly remarkable values of Wild and Scenic river segments would not be anticipated from mining.
Potential for impacts on water quality, free-flowing segments, and outstandingly remarkable values of Wild and Scenic river segments from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. NWP may slightly change stream flows of Soda Butte Creek, Clarks Fork or Stillwater R. Scenic values of Stillwater R. within the study area could be affected.	Potential for impacts on water quality, free-flowing segments, and outstandingly remarkable values of Wild and Scenic river segments from mining related activities forecast under this Scenario would be much less than under Scenario A-1.	Potential for impacts on water quality, free-flowing segments, and outstandingly remarkable values of Wild and Scenic river segments from mining related activities forecast under this Scenario would be similar to Scenario A-1. Risks to water quality, free-flowing character, and outstandingly remarkable values of the Stillwater R. would be reduced due to the proposed mineral withdrawal.	

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

<table>
<tr><th>Alternative A,
No Mineral Withdrawal
Scenario A-1: NWM
Agreement Not Implemented</th><th>Alternative A,
No Mineral Withdrawal
Scenario A-2: NWM
Agreement Implemented</th><th>Alternative B,
Mineral Withdrawal Implemented
Scenario B-1: NWM
Agreement Not Implemented</th><th>Alternative B,
Mineral Withdrawal Implemented
Scenario B-2: NWM
Agreement Implemented</th></tr>
<tr><td colspan="4">Air Quality</td></tr>
<tr><td colspan="3">Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities would cause particulate and gaseous emissions as well as visibility impacts that would effect overall air quality.</td><td rowspan="2">Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on water quality, free-flowing segments, and outstandingly remarkable values of Wild and Scenic river segments would not be anticipated from mining.</td></tr>
<tr><td>Potential for particulate and gaseous emissions as well as visual impacts from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. Emissions would likely not exceed Prevention of Significant Deterioration (PSD) or National Ambient Air Quality Standards.</td><td>Potential for impacts on air quality from mining related activities forecast under this Scenario would be much less than under Scenario A-1.</td><td>Potential for impacts on air quality from mining related activities forecast under this Scenario would be similar to Scenario A-1. Potential for air quality impacts to Yellowstone NP and wilderness areas would be reduced because mining would be concentrated in the center of the study area.</td></tr>
</table>

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Land Use Change			
Potential metal production from known mineral reserves (New World Project) could include 2.3 MM oz. of gold, 8.8 MM oz. of silver, and 132 MM lb. of copper. Speculative production could include 2.6 MM oz. of gold, 10.0 MM oz. of silver, and 179 MM lb. of copper.	There would be no metal production from known mineral reserves. Speculative production could include 2.6 MM oz. of gold, 10.0 MM oz. of silver, and 179 MM lb. of copper.	Potential metal production would be the same as with Scenario A-1.	No metal production would be anticipated.
New World Project Alternative would not be affected. Additional options could be developed on federal land available for mineral entry.	The New World Project would not be developed due to the NWM Agreement.	Three alternatives and other options for development and/or mitigation would be unavailable because of the mineral withdrawal. Alternative locations for sites on private land may be less environmentally desirable.	The New World Project would not be developed due to the NWM Agreement.
Private Land and Unpatented Mining Claims would not be affected.	The NWM Agreement may affect development of private land interspersed with interests acquired under the NWM Agreement.	Development of private lands and unpatented federal mining claims may be affected by lack of available lands for mine facilities.	Mining development of remaining lands may be affected by the lack of available land for facilities.

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TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A. No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A. No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B. Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B. Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Economics			
Mining-related effects would vary by Scenario, based on probability of mineral development; however the following contains a description of general economic effects of mining. Employment and income would peak during mine development, decline slightly and level off during mine operation. Temporary jobs would be created by exploratory drilling operations, powerline construction, work camp construction, mine reclamation, plowing highways in the winter, building homes for employees, and highway maintenance. Costs to local governments would increase with increased demand for services as workers move to the area. Montana county and local budgets may be balanced by increases in tax base or by offsets that result from the Montana Hard-Rock Mining Economic Impact Act and the Proper Tax Based Sharing Act. County and local governments in Wyoming may experience budget shortfalls. Mining would increase economic diversity but not economic dependency. Mining and year-round access between Cody, WY and Cooke City, MT would tend to stabilize the Cooke City economy while the mine(s) operate. The level of economic impacts would depend on the number and size of mines developed.			The likelihood of mining and related economic impacts would essentially be eliminated.
Potential for economic impacts from mining related activities forecast under this Scenario would be more likely than with the other Scenarios.	The potential for mining-related economic impacts would be significantly reduced since the area of highest mineral development potential would be unavailable for mining due to the NWM Agreement.	Mining related economic impacts would be similar to Scenario A-1 due to anticipated development of the NWM.	

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TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

<table>
<tr>
<th>Alternative A.
No Mineral Withdrawal
Scenario A-1: NWM
Agreement Not Implemented</th>
<th>Alternative A.
No Mineral Withdrawal
Scenario A-2: NWM
Agreement Implemented</th>
<th>Alternative B.
Mineral Withdrawal Implemented
Scenario B-1: NWM
Agreement Not Implemented</th>
<th>Alternative B.
Mineral Withdrawal Implemented
Scenario B-2: NWM
Agreement Implemented</th>
</tr>
<tr>
<td colspan="4">Social</td>
</tr>
<tr>
<td colspan="3">Mining-related effects would vary by Scenario, based on probability of mineral development; however the following contains a description of general social effects of mining. Population would increase by about 50 permanent residents in the Cooke City/Silver Gate, MT area and by an estimated 360 to 1,290 permanent residents per mine in Park Co., MT, and Park Co., WY. Population increases would also occur from employment related to other activities. Demand for housing, schools, emergency services, domestic water, wastewater and solid waste disposal, and social services would increase, especially in Cody and Powell, WY. Some infrastructure has little or no room to absorb the growth. Added tax revenues could fund new services or improve existing facilities or services. However, this would be more likely in Park County, MT than in Park County, WY. Mining would alter the social character and quality of life in Cooke City and Silver Gate, especially for long-term residents. Some social and cultural values would also change. The level of social impacts would depend on the number and size of mines developed.</td>
<td rowspan="2">Social impacts related to mining would probably be avoided. Social change would continue as the local communities grow, but at a much slower rate than if mining occurred.</td>
</tr>
<tr>
<td>Potential for social impacts from mining related activities forecast under this Scenario would be more likely than with the other Scenarios.</td>
<td>The potential for mining-related social impacts would be reduced due to the NWM Agreement.</td>
<td>Social impacts would be similar to Scenario A-1 due to the development of the NWM.</td>
</tr>
</table>

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Cultural			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities could include damage or alteration to individual cultural sites. Increased use of the area or improved access to sites could also result in damage to sites and loss of the integrity of the New World Historic District (NWHD).			Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on cultural resources, especially the integrity of the NWHD would not be anticipated from mining.
Potential for impacts from mining-related activities forecast under this Scenario would be more likely than with the other Scenarios. Activities would affect the integrity of the NWHD.	Potential for impacts on cultural resources and especially the integrity of the NWHD from mining related activities forecast under this Scenario would be much less than under Scenario A-1.	Potential for impacts on cultural resources, especially the integrity of the NWHD from mining related actions forecast under this Scenario would be similar to those with Scenario A-1. Mineral development in the NWHD would be likely.	
Wildlife			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities could cause loss of wildlife habitat, including grizzly bear habitat. Human caused mortality could also result from mining related activities.			Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on wildlife habitat and populations would not be anticipated from mining.
Potential for impacts from mining-related activities forecast under this Scenario would be more likely than with the other Scenarios. Mineral activities in the high development potential areas could affect grizzly bear core habitat areas, elk and moose winter range, mountain sheep summer and winter range, and mountain goat range.	Potential for impacts on wildlife habitat and populations from mining-related activities forecast under this Scenario would be much less than under Scenario A-1. Grizzly bear core habitat would remain available for mineral development.	Grizzly bear core habitat areas, elk and moose winter range, most mountain sheep summer range, and most mountain goat range would be withdrawn from mineral entry. Mining anticipated in central portion of study area would result in effects similar to Scenario A-1 if human activity and recreation use increases in important wildlife habitats.	

CHAPTER 3
AFFECTED ENVIRONMENT AND EFFECTS ANALYSIS

INTRODUCTION

This chapter describes the resources and values that could be affected by the alternatives under consideration. The resources and values discussed were raised as issues during scoping (See Chapter 1). Also described in this chapter are the environmental consequences that are anticipated from each alternative.

For each issue, the affected environment is described first. This is followed by a description of the anticipated environmental impacts of each alternative with and without the NWM Agreement (four scenarios). This organization is used to enable the reader to more easily understand the relationship between the affected environment and the anticipated environmental impacts of each issue. Where possible, the effects of the NWM Agreement are separated from the effects of a mineral withdrawal.

Included in the description of environmental impacts is a brief summary of the sources of potential environmental effects.

Nature of Effects Analysis

The mineral withdrawal analysis focuses on a policy level decision concerning the appropriateness of future mining on federal lands in the area considering other public values present. This broader look at the area differs from the "project level analysis" employed for the New World Project. As illustrated in Table 3-1, the project level analysis focuses on quantifying the effects on site-specific alternatives. The specific location and magnitude of effects can be quantified. For example, the sediment generated from the construction of 2 miles of road in the Daisy Creek drainage could be measured based on soil type, grades, road design, etc.

As a mineral withdrawal is a policy decision that does not result in surface-disturbing activities, there are no direct effects on water, wildlife, and other biological and physical resources in the study area. The environmental effects of mineral withdrawal alternatives are based on assumptions about potential development that could occur as described in the Forecast for Mineral Activity, Table 3-2. Environmental effects tend to be expressed in more general terms, focus more on changing trends, and are expressed more in terms of probable risks. These environmental effects are much less site specific and usually can not be quantified as well as the impact analysis of a site specific proposal. Site-specific effects of the New World Project (mine) are used as an example of potential mining-related effects.

TABLE 3-1: NATURE OF THE ANALYSIS

NATURE OF ANALYSIS	
Mineral Withdrawal (Policy Level Decision)	**New World Project (Site Specific Project Decision)**
Effects largely based on assumptions about future mineral development	Effects based on site-specific plans
Effects are described on area or drainage level	Effects are site-specific based on location of facilities
Effects less easily quantified; described in terms of change, risk, trends	Effects can be more easily quantified or measured

Mining-Related Risk to the Environment

A number of comments on the Draft EIS raised the issue of the risk to area resources from potential mineral development. The concept of risk embodies two components: the likelihood of an event occurring, and the environmental consequences produced by the event should it occur. Expressed more simply:

Risk = (likelihood) x (consequences)

A recently completed Failure Modes Effects Analysis Training Case Study helps characterize mining-related risk for the Final EIS. Failure Modes Effects Analysis, or FMEA, is an engineering reliability technique used to systematically identify, characterize, and screen risks that derive from failure of an engineered system to operate or perform as intended.

Although the FMEA was prepared primarily as a training tool it helps characterize mining-related risk for the Cooke City Area Mineral Withdrawal EIS. The purpose of introducing this data is not to draw any conclusions concerning the validity of the formerly proposed New World Project. Rather, the analysis provides for improved understanding of mining-related risk factors.

Appendix H, Failure Mode Effects Analysis, provides an overview of the FMEA process. The basic approach of

TABLE 3-2: FORECAST FOR FUTURE MINERAL ACTIVITY

	Alternative A **No Mineral Withdrawal**		**Alternative B** **Mineral Withdrawal**	
	Scenario A-1 NWM Agreement Not Implemented	**Scenario A-2 NWM Agreement Implemented**	**Scenario B-1 NWM Agreement Not Implemented**	**Scenario B-2 NWM Agreement Implemented**
Mines	• 2 Underground • 1 Surface	• 1 Underground • 0 Surface	• 2 Underground • 1 Surface	No mines
Probability of Development	• New World Project developed • 2nd Underground mine: > 1:50 • Surface mine: 1:10	• Underground mine: < 1:50	• New World Project developed • 2nd Underground mine: < 1:50 • Surface mine: < 1:10	
Exploration Activity	10 Operations	5 Operations	7 Operations	1 Operation
Location of Activity	Map 2-1; mostly private land	Map 2-2; mostly federal land	Map 2- 3; mostly private land	Map 2-4; private land

FMEA is to divide a project facility into logical components, analyze each component, and ask questions: What could go wrong? What is the likelihood of it happening? And, what are the consequences?

Key components identified in the Case Study included tailings dams and impoundments, underground mine workings, and water management facilities. Each of the main components are further sub-divided into sub-components, and failure modes are identified for various aspects of each component. The failure modes also consider the development phases which include: construction (2 years), operation (10 to 20 years), decommissioning (30 years) and post closure land use (1,000 years).

The likelihood of something going wrong with a component as well as the probable consequences are summarized. Consequences focus on potential effects to water quantity, water quality and aquatic life. Mitigation or compensation factors are identified for each failure mode. Appendix H describes the process in more detail.

Use of FMEA in the Withdrawal EIS

The FMEA discloses that the likelihood of failure varies by component and alternative, ranging from very low to high. The environmental consequences range from negligible to extreme depending on the component and alternative being considered. Appendix H includes a summary of FMEA results for New World Mine alternatives.

The FMEA provides a characterization of risk associated with the mining of one known mineral deposit in the area. It does not necessarily characterize the full range of risk that might be associated with as yet undiscovered deposits and hypothetical mine proposals in the area. The FMEA does serve as an example of the types of failure modes, likelihood, and consequences that could be expected from mineral development in the area. Reference to the FMEA is incorporated in the Chapter 3 sections on Water Quality, Water Quantity, and Aquatic Resources.

Forecast for Future Mineral Activity

For purposes of this analysis, a hypothetical model was developed to estimate future hardrock mining in the study area. This model, called the "Forecast for Future Mineral Activity" is summarized in Table 3-2 and is described in detail in Appendix B. The forecast considers the type of potential mining activity and the relative probability of occurrence, by Scenario. The forecast considered numerous factors such as quantity, grade, and location of known mineral reserves, the potential for other mineral occurrence in the area, land status, economics and mineral markets, mining technology, and the mining and environmental laws and regulations. The forecast is speculative in nature and is not meant to imply that the listed activities would actually occur. The forecast serves as a basis for evaluating the potential effects of a withdrawal on mineral resources in the study area, and it serves as a basis for assessing the potential effects of mining-related actions to area resources.

The mineral forecast varies depending upon whether or not there is a mineral withdrawal and the NWM Agreement. The forecast for each alternative and NWM Agreement Scenario are summarized in Table 3-2. Aside from the proposed New World Project, the location of future mineral development is speculative. Maps 2-1 through 2-4 depict where development is likely to occur with each alternative and with each NWM Agreement Scenario.

Mining-related actions

The Effects Analyses sections includes the term "mining-related actions." Mining-related actions include:

- Prospecting, Exploration - access, drilling, geophysical exploration, trenching, pits, underground geophysical exploration, bulk sampling
- Development - drilling, development shafts and adits, access, power, communications, mine and millsite preparation
- Production - underground and surface methods, ore dressing, wastes, roads
- Reclamation

See USDA Forest Service General Technical Report INT-35 for a discussion of these actions. Mining-related actions for a major mine in the study area include workcamps, construction of a powerline into Wyoming, and plowing snow on previously unplowed segments of Highway 212 east of Cooke City.

SURFACE AND GROUND WATER, WETLANDS, AND FLOODPLAINS

Substantive Changes Between the Draft EIS and Final EIS

In the Water Quantity—Affected Environment section, under Streamflow, a section was added on mudslides and floods.

In the Water Quantity—Affected Environment section, under Ground Water, the seasonal timing of snowmelt recharge was clarified.

In the discussion of the effects to Water Quality of Alternative Scenario A-1, a section describing the Failure Modes Effects Analysis (FMEA) and the results of that analysis has been added.

In the discussion of the effects to Water Quality of Alternative Scenario A-1, a section was added describing a tailing impoundment located partially within the Soda Butte drainage.

In the Surface Water Quality—Affected Environment section, a section was added on recent research concerning metal concentrations in tree rings of streamside Englemann spruce in Fisher, Daisy and Miller Creeks.

In the Surface Water Quality—Affected Environment section, information was added on sewage and nutrient leakage from the Cooke City and Silvergate areas into Soda Butte creek.

In the discussion of the effects to Surface Water Quality of Alternative Scenario A-1, a section describing the Failure Modes Effects Analysis (FMEA) and the results of that analysis has been added.

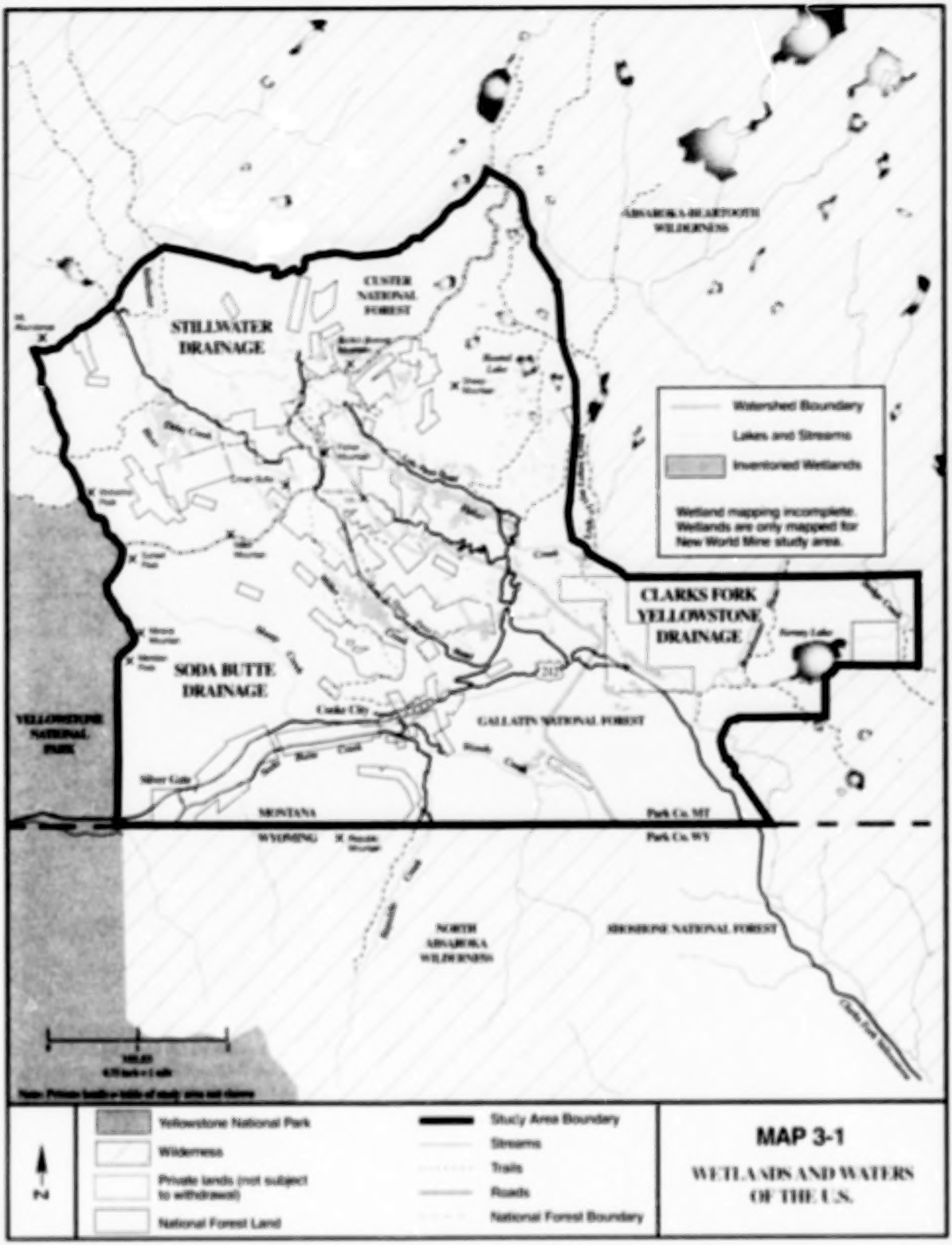
In the discussion of the effects to Surface Water Quality of Alternative Scenario A-1, a paragraph describing the effects of increasing recreational use and residential development has been added.

In the discussion of the effects to Surface Water Quality of Alternative Scenario B-1, a sentence is added indicating the water quality effects of this Scenario would be similar to Scenario A-1 but with less probability of additional (to the New World Project) effects from an underground mine and surface mine.

Introduction

This section considers the effects of the alternatives on water quantity (streamflow), legal availability of water, surface and ground water quality, and wetlands and floodplains.

The study area includes the headwaters of the Stillwater River and Daisy Creek, the headwaters of the Clarks Fork River and Fisher Creek, and the headwaters of Soda Butte Creek, including Miller Creek, Republic Creek, Woody Creek, and Sheep Creek (Map 3-1). A short segment of the Broadwater River, a major tributary of the Clarks Fork, flows through the southeastern portion of the study area. Study area watersheds are generally high, rocky, and steep, ranging from Sheep Mountain (10,616 feet) to the valley



MAP 3-1

WETLANDS AND WATERS OF THE U.S.

floor where Soda Butte Creek enters Yellowstone NP (7,360 feet).

Waters that originate in the study area flow into the surrounding A-B Wilderness and Yellowstone NP. Degradation of water quality for streams that flow into the adjacent wilderness or Yellowstone NP is not permitted under Montana and Wyoming water quality regulations. Portions of the Stillwater, Clarks Fork and Soda Butte Creek are eligible rivers under the Wild and Scenic River Act. The Clarks Fork is a designated wild river in Wyoming, downstream from the study area. (Refer to Wild and Scenic River section of this document for additional discussion of affected environment and effects to eligible and designated Wild and Scenic Rivers).

Water Quantity

Affected Environment

General Description of Watersheds

Stream channels generally have riffle/pool sequences, with pools often formed by boulders or woody debris. Stream channels are typically steep to moderately steep, low to moderate sinuosity, low to moderate bankfull width/depth ratios, and of low to moderate floodplain/bankfull width ratios. Channel bed materials are composed of boulders, cobble, gravel, and sand. Stream channels on the granitic and sedimentary rock watersheds, lying in the north to northeast and middle portions of the study area, are generally stable, with streamflow and sediment in dynamic equilibrium. Stream channels on the volcanic rock watersheds, lying in the south, southwest, high and middle portions of the study area, are less stable, with sediment loads during spring snowmelt and intense rain storms.

Approximate drainage areas for study area streams are: 4.2 mi^2 for Fisher Creek, 1.4 mi^2 for Daisy Creek, 2.4 mi^2 for Miller Creek, 3.0 mi^2 for Sheep Creek, 6.6 mi^2 for Republic Creek and 5.4 mi^2 for Woody Creek at their confluence, and 1.9 mi^2 for Soda Butte Creek above Miller Creek.

Streamflow. Bankfull channel widths in the study area are defined by approximately 1.5 year recurrence interval flows, a frequent flow event occurring almost every other year which moves bed and bank materials, doing work on the channel, and depositing overbank sediment forming floodplains and valley bottoms. Estimated bankfull widths in downstream reaches for major assessment area stream channels are: Fisher Creek 15 ft, Daisy Creek 3 ft, Miller Creek 17 ft, Sheep Creek 5 ft, 20 ft for both Republic and Woody Creek, Soda Butte Creek 10 ft, Broadwater River 30 ft, and Sedge Creek 8 ft.

Study area streams are formed by ground water emergence in stream channels and/or seeps and springs. In Daisy Creek, Fisher Creek, and Miller Creek, and in drainages where mining has occurred, some streamflow arises in mine adits from ground water interception. Many of the area springs and seeps form wetlands. Average annual flows in cfs (cubic feet per second), are: 3 cfs and 25 cfs for upper and lower Fisher Creek, 2 cfs and 12 cfs for upper and lower Daisy Creek, 19 cfs for lower Miller Creek, 1.5 cfs and 68 cfs for upper and lower Soda Butte Creek, and 54 cfs for the Upper Stillwater River. Most streamflow occurs during spring snowmelt months of April, May, June, and July.

Steep terrain, heavy snowpack, and occasional localized intensive rainstorms result in frequent debris flow mudslides in the study area. Highway 212 culverts and ditches are frequently impacted with mudslides. Snowmelt runoff in 1996 resulted in severe mudslides and flooded sections of Highway 212 for several days.

Ground Water. Valley bottoms in the study area have alluvial/glacial deposits of boulders, cobble, gravel, sand, silt, and clay. Ground water in the interstitial spaces of the gravel, sand, and coarser materials is common near streams and lakes. Ground water storage in the valley bottoms is limited by relatively shallow depths of the alluvial/glacial deposits. Ground water movement in the alluvial/glacial deposits can be relatively rapid, although many orders of magnitude slower than surface water movement.

The bedrock in the New World Project (NWP) area is described in the NWP PDEIS section 6.2.1 (USFS, State of Montana, 1996). The bedrock generally has low to medium permeability with areas of high permeability where weathered or in faults and fractures. Ground water movement in bedrock is predominately controlled by bedrock fractures and faults. Faults in the study area are nearly vertical, generally trend north-south and east-west. Northwest trending faults are less dominant, but coincide with the regional northwest oriented topography. Fracture patterns are generally oriented parallel with faults (Kirk, 1995). Some fracture systems in the area are conduits for ground water flow, while others may be hydraulic barriers that limit flow. Some of the fractures are open and with the associated high head (several hundred to 2000') have potential for rapid groundwater movement. The dominant direction of geologic structures and ground water fracture flow is in the north-south direction.

Ground water in the unconsolidated valley aquifers is hydraulically connected to, and recharged by, the bedrock ground water system. Streams in the valley alluvial deposits are connected to, and recharged by ground water. Many headwater reaches are gaining ground water, while some reaches, especially in lower sections, may lose water to the alluvial ground water system. Numerous wet areas in the valley sides occur where ground water is flowing toward the valley floor from bedrock fracture systems. Springs reflect the intersection of ground water flow with the ground surface, and are often located on valley sideslopes above the streams as well as at toes of mountain slopes. Ground water supports many wetlands in seeps, springs, and shallow water tables. Some historic mine adits intercept groundwater, converting bedrock fracture water to surface flows.

Depths to ground water range from near ground surface in valley floors to as much as 300 feet below ground surface near the summit of Henderson and Fisher mountains. Water tables fluctuate seasonally with snowmelt recharge in spring and early summer and a gradual decline from mid-summer through the following winter.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

Streamflow reductions in the study area are most likely to occur by groundwater interception into mine workings, thereby reducing discharge into area creeks, springs, and seeps. Based on section 7.2 of the NWP PDEIS, the 100 year low flow discharges in streams affected could be reduced by up to 15-20 percent during the life of the mine. Several types of groundwater mitigation, such as grouting, backfilling, or portal plugging could be used to reduce the ground water interception and surface flow reduction.

During construction of the New World mine, ground water would flow into the underground workings, when a saturated fracture, joint, fault, or bedding plane is first encountered during blasting or excavation. Inflow may or may not continue from fractures, depending on connection to surface recharge. The NWP PDEIS section 7.2 estimates that average steady state mine inflow rates from mine workings (assuming no backfill or other ground water mitigation) were estimated to vary from about 0.34 to 0.43 cfs (150 to 200 gpm). Overlying springs and ground water might be drained if fault zones act as ground water conduits. This would be sufficient to reduce the ground water table in portions of Henderson mountain. In addition, some of the ground water currently discharging directly to Miller and Fisher Creeks could be diverted into the mine workings, resulting in dewatering of portions of the existing aquifer. The New World mine proposal, for most of the alternatives, would discharge excess water to the Clarks Fork River. Net flow reductions to Soda Butte Creek would have to be augmented.

The NWP PDEIS, section 7.2, estimated, for 100 year low flow conditions, reduction in Fisher Creek of 0.32 cfs—0.7 cfs (14-30 percent low flow reduction) and a 0.12—0.15 cfs reduction (15 to 19 percent) in Miller Creek. These estimated flow reductions used the conservative assumptions that ground water base flow would be affected to the full extent possible by 1) collection of Glengarry adit flows 2) no ground water mitigation 3) half of the entire base flow of Fisher Creek in a 2,500 foot segment directly below the mine would be eliminated 4) and low flow in the east fork of Miller Creek would be eliminated during the life of the mine. Construction of an open pit mine in the analysis area (most likely in the McLaren and Como pit areas in upper Daisy and Fisher Creeks) could also intercept water in saturated fractures, joints, faults, and bedding planes. This water could be diverted to the mill circuit or treated and discharged but would result in additional flow reduction in adjacent springs and streams. Potential development of a second underground mine and an open pit mine would further increase ground water interception and reduce streamflow and springs discharge in adjacent areas (primarily Fisher Creek and, to a lesser degree, Miller Creek).

The Failure Modes Effects Analysis (FMEA) prepared for the NWP (Appendix H) quantified risk for various components or potential failure modes identified for the alternatives presented in the NWP-PDEIS. (USDA Forest Service, 1997). Risk is defined as the likelihood of a failure occurring times the consequences to water quality and aquatic life. The likelihood or probability of occurrence of each potential failure mode was further quantified using a 5 level scale of annual probability (see Appendix H, Table H-2) ranging from negligible to high probability. Consequences to water quantity were categorized into five main levels (Appendix H, Table H-1) ranging from negligible to extreme. These consequence categories for water quantity were based on projected flow reduction in Miller Creek at Site SW-2 and at Fisher Creek at site SW-4.

The results of the FMEA demonstrate that for most of the alternatives (Appendix H, Summary Tables) the risk for flow reduction in Miller Creek is rated as low probability with low consequence, while the risk of flow reduction in

Fisher Creek is rated as very low during construction, operation, decommissioning, and post mining land use. The FEMA also includes a risk management plan which summarizes risk issues and potential compensation measures by NWP alternative.

Potential ground water mitigation techniques include: grouting (particularly higher inflows fractures or faults), grout curtains, cutoff walls, seals and plugs, bulkheads, and mine backfill (concentrated slurry or paste backfill). The Environmental Protection Agency, in a review letter of preliminary drafts of this EIS, expressed concern that long term effectiveness of portal plugging in the study area is doubtful given the geo-chemical conditions and high head that could drive these flows through or around engineered solutions.

Some of the NWM alternatives include a tailings impoundment partially within the Soda Butte drainage which would discharge to Fisher Creek. Water captured by impoundments in the Soda Butte drainage and conveyed out of the drainage is also subject to augmentation by replacing the water to Soda Butte Creek per the NPS/DNRC water right compact.

In addition to ground water and impoundment interception, water use associated with mining would include domestic use of water for mining, primarily wells associated with administrative facilities and work camps. Use of water for mining domestic purposes requires obtaining water rights through the State of Montana. Any appropriations for mining or domestic water use in the Soda Butte Creek drainage is subject to the National Park Service/Montana Department of Natural Resources and Conservation (DNRC) water rights compact discussed in the Legal Availability of Water section of this EIS.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

The New World Project would not be developed, and only minor exploratory drilling would be anticipated in areas not included in the agreement. The main streamflow effect would be cumulative effects due primarily to past mining activities which have altered ground water levels in the vicinity of area adits, particularly the Glengarry and Gold Dust adits. If an underground mine is developed, surface flow depletion effects could be similar to the New World mine, depending on the location and extent of underground workings.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

Ground water interception and streamflow reduction effects could be similar to previously described for Scenario A-1 due to anticipated development of the New World mine. The area of highest mineral potential, located on private land and existing unpatented mining claims, remains available for mineral entry. Areas that remain available for mining are concentrated in the Fisher Creek and Miller Creek drainages. Additional exploration and development is possible; any such development would generate effects in addition to the anticipated effects from the NWP.

The proposed mineral withdrawal would immediately affect 17,760 acres of unclaimed National Forest system lands. The potential for ground water interception, streamflow, and spring flow reduction due to mining in withdrawn portion of streams is reduced. For example, the withdrawal includes most of the Sheep, Woody, Republic, and Stillwater drainages. Mineral activity on available lands could affect streamflows on lands withdrawn.

Past mining activities have altered ground water levels in the vicinity of area adits, particularly the Glengarry adit and McLaren pit. Development of the New World mine would have cumulative effects by further affecting ground water levels and flow direction in Henderson Mountain, Fisher Mountain, or other areas affected by additional mining. This alternative, by withdrawing the federal lands, would reduce the potential for additional stream flow reduction. No cumulative effects on water quantity are anticipated from the reasonably foreseeable activities identified in Appendix C.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

This Scenario would reduce the potential for changes in water quantity from mine development. No water quantity effects from the estimated one exploration operation would be expected. This Scenario would greatly constrain potential mineral development in the study area so the cumulative effects would be primarily the historic alterations of ground water levels around adits. This Scenario would have the least effect on streamflow as it would result in only minor amounts of mineral exploration but no foreseeable mine.

Dewatering of Henderson Mountain and Fisher Mountain would not occur as no additional ground water would be intercepted beyond existing mine and exploration impacts and streamflow and spring discharge would remain essentially unchanged. Reclamation of historic mine disturbances, however, could reduce flow in the existing Glengarry adit. Adit flow reduction could elevate ground water tables in upper Fisher Creek and form new springs which might offset the reduction in streamflow. No cumulative effects on water quantity are anticipated from the reasonably foreseeable activities identified in Appendix C.

Legal Availability of Water

Affected Environment

Water Right Claims

Water right claims in the study area have been filed for several uses including: mining, domestic, livestock, power generation, recreation, and commercial. The Montana Water Court has issued a Temporary Preliminary Decree in the upper Yellowstone River drainage, which includes Soda Butte Creek to its headwaters. Silver Gate and Cooke City water use occurs primarily from springs.

Section 7.4 of the NWP PDEIS contains a listing of all of the surface water right claims for Fisher, Miller, Lady of the Lake, and Daisy creeks, and the upper Stillwater River. For several of the streams, particularly Fisher Creek and Lady of the Lake Creek, surface water rights claims are much greater than measured flow rates, even during high flows. None of the claims have yet been adjudicated to rights by the Montana Water Court at which time the claimed amounts and/or diversion rates may be reduced based upon actual water use and availability.

Before mining water use can begin, mining companies would have to establish legal rights under the Montana Water Use Act for all direct surface and groundwater diversions and for indirect surface water depletion. Reduced flows in Fisher and Miller Creeks that harm downstream senior water users would need to be replaced. This could consist of transferring the consumptive use portion of existing water rights to unappropriated water available near the mining area.

The State of Montana has completed a water rights compact with the United States for Yellowstone NP (USDI, State of Montana, 1994). The compact defines the consumptive use and instream flow rights that the National Park Service (NPS) has on Soda Butte Creek. The water rights compact has closed the Soda Butte Creek basin to further appropriation except for a small amount of the creek flow which can be consumptively used. The NPS has instream flow rights for the entire flow of Soda Butte Creek, less any United States consumptive use rights. During low flow periods, the NPS has a right to maintain a critical level at the point where Soda Butte Creek enters Yellowstone NP. Only during the high flow month of June are new rights for consumptive use available in Soda Butte Creek.

The NPS instream flow rights for Soda Butte Creek are subordinate to certain existing and future surface and ground water rights. During periods of less than normal flow, the NPS has a right to maintain a critical level of flow at the point where Soda Butte Creek enters Yellowstone NP. At such a time, subordination to consumptive uses only applies to domestic uses of 35 gpm or less, to any right held by either Silver Gate or Cooke City with a priority date before January 1, 1993, to any use considered non-consumptive as defined by the compact, and to any use of groundwater which is not connected to surface water flow within the basin. The low stream flows in Soda Butte Creek at the Park boundary at which subordination is limited are by month: January 5.4 cfs, February 5.1 cfs, March 4.0 cfs, April 1.7 cfs, May 116.9 cfs, June 332.5 cfs, July 120.7 cfs, August 46.4 cfs, September 15.3 cfs, October 14.2 cfs, November 9.9 cfs, and December 6.3 cfs (NWP PDEIS, section 7.3).

Depletion to and changes in the timing of streamflow of Miller and Soda Butte Creek would occur through the consumptive use of water by mining, or the transfer of water from the Soda Butte Creek basin to the Fisher Creek Basin. Because of the rights established by the water rights compact, any streamflow depletions or changes in timing in Soda Butte Creek at the Yellowstone NP boundary caused by the mine during construction, operation, or post mining would need to be replaced (except during months when appropriable water is still available) with water that would not degrade the water quality of the receiving stream. Mining companies would have two options to meet the requirements of the compact:

- purchase, lease, and retire existing water rights for such a purpose from the Soda Butte Creek basin or a nearby basin
- obtain new water rights to divert water for replacement from a nearby basin which is not fully appropriated

For existing water rights, mining companies could reduce the timing of the use or the amount of consumptive use of the water right by going through a change application process with the State of Montana.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

Direct and indirect effects of mine exploration on the legal availability of water relate to the need to establish water rights for mine activities and compliance with existing water rights commitments. The development of an underground mine on private lands and associated consumptive water use would require establishment of legal water rights for all direct surface and groundwater diversions and for indirect surface water depletion.

Compliance with the NPS/Montana water rights compact in Soda Butte Creek would require augmentation of depleted flows to Soda Butte Creek or tributaries for all direct surface and groundwater diversions and for indirect surface water depletions. Augmentation would be required throughout the year with the possible exception of June for the interim range of flows in Soda Butte Creek. The NPS/Montana water rights compact, however, would limit the amount of additional water available for domestic appropriation.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

This Scenario would reduce the need to establish legal availability of water for mining compared to Scenario A-1 since the New World mine would not be developed. The risks of potential effects are reduced for the Fisher Creek and Miller Creek drainages due to the NWM Agreement. Other drainages in the study area remain available for mineral entry. Reasonably foreseeable activities in and near the study area could increase the consumptive use demand, particularly additional domestic and recreational development in the Silver Gate and Cooke City areas, and possibly consumptive water use associated with reclamation of historical mine disturbances. The NPS/Montana water rights compact, however, limits the amount of additional water available for domestic appropriation.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

This Scenario would be similar to Scenario A-1 due to anticipated development of the NWM. The area of highest mineral potential remains available for mineral entry. Potential effects would be concentrated in the Fisher Creek and Miller Creek drainages. The mineral withdrawal reduces the potential for effects in drainages withdrawn from mineral entry, including Sheep, Republic and Woody creeks, and the Stillwater and Broadwater rivers.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

The withdrawal of federal land in combination with the NWM Agreement reduces the likelihood of the need to secure the legal availability of water for mining. No newly constructed mine diversions of surface and ground water are anticipated. Water would not likely be used consumptively for mining or domestic purposes by mining, nor would water likely be diverted from Soda Butte Creek and discharged into Fisher Creek. Additional minor water rights would likely not have to be obtained nor an augmentation plan developed to offset effects on senior water users or the water rights compact.

With the agreement, additional mine related water appropriations are not likely. Reasonably foreseeable activities in and near the study area could increase the consumptive use demand, particularly additional domestic and recreational development in the Silver Gate and Cooke City areas, and possibly consumptive water use associated with reclamation of historical mine disturbances. The NPS/Montana water rights compact, however, limits the amount of additional water available for domestic appropriation.

Surface Water Quality

Affected Environment

Water quality in the study area is affected by a diverse range of factors including geologic conditions and associated ground water/surface water interactions, and water chemistry types, historical mining effects, existing developments (roads, buildings, etc.) and disturbances (timber harvest, forest fires, etc.), natural high sediment yielding events such as debris flows and landslides, and precipitation and streamflow variability. Several naturally occurring acid seeps and springs (from sulfate mineralization) are located in the upper Daisy, Fisher, and Miller Creek watersheds (Furniss, 1996). Historical mining disturbance has greatly accelerated acid rock drainage (ARD) in the study area.

Montana water quality standards, mandated by the Clean Water Act and promulgated under the Montana Water Quality Act, direct the protection of beneficial water uses including aquatic life. Assessment area streams are classified by Montana as B-1 streams except for portions of the Clarks Fork and Stillwater rivers in the Absaroka Beartooth Wilderness, which are classified as A-1. The Montana B-1 classification states these waters are "... suitable for drinking, culinary and food processing purpose, after conventional treatment; bathing and swimming recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply." No degradation of water quality is allowed in the wilderness portions of the Clarks Fork and Stillwater rivers. In all B-1 classified streams, increases in concentrations of regulated parameters, such as sulfate, specific metals and lowering of pH, are limited to nonsignificant levels, depending on their potential for harm to human health and environment, including aquatic life.

Acid-rock drainage (ARD) is a term used to describe acidic leachate, seepage, or drainage that results from the breakdown or reaction of sulfide materials, such as pyrite or "fool's gold", when exposed to air and water. This breakdown or reaction of sulfide minerals occurs naturally at or near the earth's surface, as evidenced by the common presence of yellow-orange stains or deposits around exposed pieces of iron, marshy sediments, or at the edges of hot springs. ARD can also be generated in non-mining settings such as natural springs that may have pH's of near 2.0. Such springs usually are located in the vicinity of outcrops of sulfide-bearing rock. Bacteria present in most surface sediments greatly accelerate the ARD-forming processes. These reactions yield low pH (acidic), high sulfate water that has the potential to mobilize metals (most commonly iron, copper, aluminum, manganese, zinc, arsenic, and nickel) contained in the geological materials that are contacted.

The formation of ARD and resulting degradation of water quality usually do not occur in metal-sulfide minerals buried in the oxygen-poor environments under which they were formed. ARD can result when these minerals react with the oxygen in air, such as when they become exposed at the earth's surface during mining. Mine tailings, waste rock piles, drainage from underground working and open-mine pits are the main sources of ARD at mine sites. the development of ARD from mine-related sources may take years before it becomes noticeable, often long after mine closure.

Acid rock drainage from Glengarry Adit, upper Fisher Creek.

All surface waters in the Wyoming portion of Yellowstone NP and in the Clarks Fork through the Wild and Scenic River section are designated as Class 1 waters by the Wyoming Department of Environmental Quality (DEQ). The Wyoming regulations require preservation of water quality. No new sources other than dams may discharge and no new existing point source may increase its discharge of pollutants into new waters so designated.

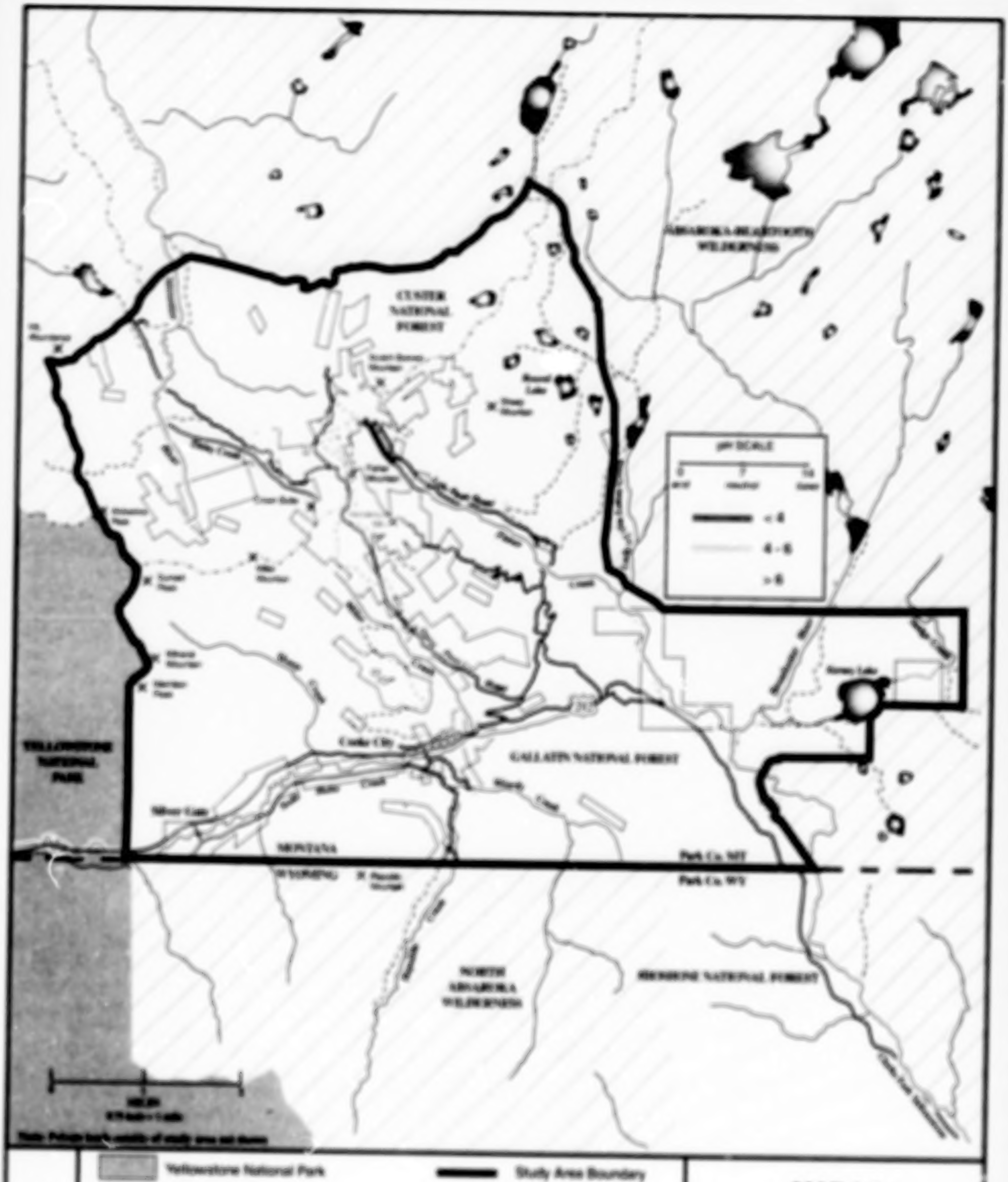
The Gallatin NF 305(b) Report (GNF, 1995), in response to Montana's listing of water quality impaired stream segments (Montana DHES, 1994), made recommendations that Daisy Creek and Fisher Creek be listed as water quality impaired throughout their lengths due to acidic and metal laden waters from mining. Soda Butte Creek was recommended for listing from the McLaren Tailings to Wyoming border, about 6 miles, due to acid and metals contamination from the tailings. Recommended for changed listing of water quality impairment is the Clarks Fork as slightly impaired by mineralized waters from Fisher Creek for five miles from the Fisher Creek and Lady of the Lake Creek confluence forming the Clarks Fork, downstream to the Wyoming border. The Montana DEQ may require identification of total maximum daily loads (TMDL's) for Fisher, Soda Butte, and Daisy Creeks. The Montana Water Quality Act does not give DEQ specific authority to develop and implement TMDL's. The DEQ is seeking legislative authority, personnel, and funding to initiate a TMDL development process.

Reclamation of historical mining-related source areas in upper Fisher and Daisy Creeks, the McLaren Pit, Como Pit, and Glengarry Adit, potentially could improve water quality for meeting beneficial water uses. Reclamation of historical mining-related sources in Soda Butte Creek, notably the McLaren tailings, could improve water quality for supporting aquatic life in the immediate downstream reaches.

Surface waters in the study area are generally calcium bicarbonate types, except where sulfate-rich acidic drainage or naturally occurring sulfate-rich seeps and ground water inflow result in calcium magnesium sulfate type water. Water chemistry varies by drainage basin, flow and proximity to mineralized areas and abandoned, historical mining sites. Section 7.5.2 of the NWP PDEIS contains a detailed description of chemical water quality of the study area streams in the New World mine assessment area. The McLaren Pit in upper Daisy Creek and Glengarry adit and Como Pit in upper Fisher Creek are acidic drainage metal enrichment sources. Acidic waters have elevated concentrations of aluminum, copper, iron, zinc, cadmium, lead and manganese which exceed chronic aquatic life standards in headwaters of Daisy Creek and Fisher Creek, and possibly in the immediate vicinity of McLaren Tailings in Soda Butte Creek. Floodplain sediments of Daisy and Fisher Creek have metal enrichment from historical upstream mine activity (Map 3-2).

Furniss (1996) has documented natural ferricrete deposition (9000+ years) from oxidative weathering of exposed sulfitic rocks in the upper Daisy, Miller, and Fisher Creeks. Daisy Creek and Fisher Creek headwaters have the most acidic and metal-laden waters of the study area due to natural mineralization and mining activity. Soda Butte Creek in the vicinity of the McLaren tailings also has acidic and metal-laden waters due to the sulfate and metals rich tailings. Miller Creek has some mine prospect activity with only minor headwaters effects of acidic drainage and metals (Map 3-2). Chamberlain (1997) measured metal concentrations preserved within tree rings of streamside Englemann spruce in Fisher, Daisy, and Miller Creeks. Initial unpublished results indicate a very large increase in iron concentraies in spruce in Fisher Creek which corresponds roughly to the timing of mining activity. Additional research is planned to measure more cores from trees and peat bogs to calibrate the relationship between metals in tree rings and soil/stream waters.

With increasing distance downstream, concentrations of sulfate and metals decline rapidly and pH and alkalinity



MAP 3-2

PH LEVELS IN AREA STREAMS

increase due to inflow of good quality surface and ground water, precipitation of iron and aluminum oxides, and metal adsorption. Daisy Creek toxicity to aquatic life from acidic and metal-laden water is diminished by dilution at the confluence with upper Stillwater River. The Stillwater River largely recovers downstream by dilution from Goose Creek. Fisher Creek toxicity to aquatic life from acidic and metal-laden water is diminished and essentially recovered at the confluence with Lady of the Lake Creek, forming the Clarks Fork, which, when confluent with the Broadwater River, has barely detectable acid metal chemistry and healthy aquatic biota. Metal concentrations in Soda Butte Creek are elevated by the McLaren tailings which leach metal into the creek, particularly when precipitation occurs on the tailings. Downstream water quality in Soda Butte Creek improves slightly with dilution from Miller Creek, then substantially from dilution from Woody Creek and Republic Creeks although abandoned mines and unmined lead deposits around the base of Republic Mountain and a pit of milled tailings, dating to the 1880's, are located near the confluence of Woody and Soda Butte Creek.

The large number of septic systems in the Cooke City and Silvergate areas probably contribute some sewage into Soda Butte creek, particularly during saturated soil conditions (snowmelt) or stormflow runoff. One of the DEIS respondents has observed raw sewage flowing over the ground in Cooke City as recently as 1995.

Ground Water Quality

In the study area in general, total dissolved solids (TDS) is low in ground water in the granitic bedrock system, intermediate in volcanic rocks, and high where sedimentary rock contains limestone. Calcium bicarbonate and sodium bicarbonate waters are common where sulfide minerals are not found. Natural concentrations of sulfide minerals as well as historically mined areas contain sulfate rather than carbonate as the major anion in ground water. Calcium/magnesium sulfate type ground water is found in the mineralized headwaters seeps and springs and historically mined areas of Daisy Creek and Fisher Creek. The headwaters of Miller Creek include a combination of carbonate and sulfate inflows, which are slightly affected by sulfide minerals and prospecting activity. Soda Butte Creek has some ground water affected by pyrite and other sulfide mineral mine tailings which are piled in and near the stream bottom and leaching from the McLaren tailings. The exposure of sulfide minerals to atmospheric oxygen and water leads to acidic ground water which dissolves or mobilizes metals such as iron, copper, aluminum, manganese, zinc, arsenic, and nickel. Acidic, high sulfate ground water with dissolved metals may be toxic to many aquatic and terrestrial lifeforms.

Sediment

Estimated existing sediment yields reflect natural geologic and soil erosion processes, such as the 1988 forest fires, as well as man-induced increases from roads, facilities, logging, and mining. Partially reclaimed waste rock piles and tailings are the largest individual sediment sources. These include the McLaren pit in Daisy Creek headwaters, Como pit tailings in Fisher Creek headwaters, and partially reclaimed tailings waste rock piles in the headwaters of Daisy, Fisher, and Miller Creeks. Roads in the assessment area are used for mine access and prospecting activity and recreation. Roads are typically low standard 4-wheel drive with limited drainage, and are frequently sediment sources. The 1988 Storm Creek fire burned much of the southern portion of the study area. Burned areas are now vegetated with grasses and shrubs and lodgepole pine seedlings. The largest amount of man-induced sediment increases are likely due to the low standard roads and associated poor drainage. Existing sediment yield estimates in tons per year (t/y), and percent above natural baseline, respectively include: 51 t/y and 36% for Fisher Creek; 32 t/y and 60% for Daisy Creek; 21 t/y and 32% for Miller Creek; and 78 t/y and 31% for Soda Butte Creek (NWP PDEIS Section 7.4). Woody Creek (tributary of Soda Butte Creek) produces high loads of fine sediments during snowmelt runoff and localized high intensity rain storms from erodible volcanic soils. A major sediment concern for water quality relates to water chemistry in the sulfide mineral areas affected by mining, such as the headwater areas of Daisy Creek and Fisher Creek, and the valley bottom McLaren tailings in Soda Butte Creek, where metals may be attached to the fine sediment particles.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

Potential water quality effects from mining within the study area consist of changes in sediment yield or chemical water quality from a variety of mining activities. Water quality in the study area could change due to direct and indirect mining effects from:

- construction of roads, mine building, workers camp, and other mine facilities
- discharge of treated excess water
- change in streamflow
- removal and treatment of poor quality adit or spring water
- acid drainage from construction sites, waste rock sites, or the tailings impoundment
- nutrient increase (mostly nitrates) from underground blasting
- seepage of water from mill and workcamp drain fields to surface water
- rerouting of runoff and stream channels
- underground mining, which may change the water quality of springs and baseflow
- catastrophic failure of mine facilities which could introduce shock loading of mine water and/or tailings

During construction phase of the New World mine, increased sediment would be caused by new road construction, widening of existing roads, installation of drainage systems, and construction of mine facilities. During construction, depending on the amount of surface disturbance and road building, stream sediment could be increased by about 30 percent to 100 percent over natural levels. The Surface Water Quality Technical Report (NWP PDEIS section 4), estimated that cumulative sediment yields would increase from the existing 31 percent to 61 percent over natural levels for streams in the project area to 31 percent to 140 percent over natural levels depending on alternative. Accumulated sediments could cause geomorphic changes to the stream due to increased sediment storage, channel aggradation and widening. This may in turn cause additional sediment production by mobilizing sediment from streambanks. Fisher Creek would have the highest levels of sediment increase.

Intercepted ground water in the mine could be treated and discharged to surface water. During the operational phase, ground water intercepted by the mine would either be used in drilling and dust suppression in the mine or used in the mill/tailings/polishing pond circuit then discharged. Suspended sediment levels would likely decrease below construction levels but remain elevated above pre-mine levels. In post operations phase, the amount of intercepted adit water would depend on the degree of success in sealing off intercepted ground water. Ground water degradation could occur as non-point sources (seeps and springs) which may not become evident until many years following closure to underground mining operations. Long term water treatment would likely be required to meet discharge ;permit conditions and limitations, Montana water quality standards, and non-degradation limitations. Post operational sediment levels would gradually decrease to pre-mine levels as exposed soils harden and reclaimed areas revegetate.

During construction, water entering the adits and the mine, as well as water used for construction purposes, could be utilized, stored, or treated, and discharged. Development of an open pit mine and an underground mine would have construction effects which would be de-synchronized with New World mine construction effects but could be cumulative with New World mine operational or post operations water quality effects.

The operational phase would vary from 8 to about 20 years for each mine, assuming all three mines were developed (Appendix B, Mineral Forecast). Water quality effects would occur from snowmelt runoff and stormflow impacting disturbed areas (roads and mine facilities). For the New World mine, increase in sediment is estimated at about 31 percent to 60 percent above natural levels (a decrease from construction sediment levels). The Surface Water Quality Technical Report (NWP PDEIS section 2), contains an extensive analysis of streamflow and discharge mass loading and the potential water chemistry effects of New World mine discharge to area streams. During operation of the New World mine, ground water inflows into the mine would either be piped to the mill or used in drilling and dust suppression. At the mill, lime would be added to mine water, then the water would be sent to the tailings impoundment. Most of the water in the tailings impoundment would be recycled for use as process water in the mill, with excess discharged using a pipeline and released into the stream through an effluent diffuser to promote mixing and avoidance of aquatic toxic concerns. The discharge point would be the Clarks Fork about a mile above the A-B Wilderness boundary. Some of the New World mine alternatives would discharge to the Stillwater River. The Crown Butte plan for the New World mine included collection of all of the Glengarry adit water, treating, and adding to the tailings impoundment water. Seepage water from the tailings impoundment would be returned to the tailings impoundment if treatment is necessary. A polishing pond would be used for final treatment (settling of solids and pH adjustment) of water before discharging. The Crown Butte plan included a provision of additional solids treatment (coagulation, precipitation, filtering, or various mechanical methods) as necessary to meet Montana water quality surface standards and non-degradation standards.

The Surface Water Quality Technical Report (NWP PDEIS section 2) estimated existing and projected water quality in the Clarks Fork river at a point about 1,500 feet above the

A-B Wilderness boundary. During September low flow conditions, the discharge was projected to cause increases in concentrations of total dissolved solids, hardness, ammonia, and nitrate. Metal concentrations for all parameters analyzed (aluminum, cadmium, copper, iron, lead, and zinc), would be equal or less than existing concentrations at the Clarks Fork upstream from the wilderness boundary. None of the projected increases were of sufficient magnitude to be considered water quality degradation in either low or high flow periods, as defined by the State of Montana (Montana DEQ, 1995). However, if concentrations remained higher than current conditions at the wilderness boundary and at the Wyoming boundary, there could be a violation of the State of Montana anti-degradation regulation for waters within Wilderness areas and Wyoming anti-degradation regulations for Outstanding Natural Resource Waters.

Some of the New World mine alternatives would capture Daisy Creek water into the mill circuit, treat, and discharge to the Stillwater River. The water quality in Daisy Creek would improve. In the Stillwater River, concentrations of total dissolved solids, sulfate, hardness, ammonia, and nitrate would increase due to discharge of the tailings impoundment water but loading of the seven metals analyzed would be reduced.

Leakage or catastrophic failure of a tailings impoundment could occur due to inadequate design, improper construction, earthquakes, flooding, or avalanches. Section 3.4 of the NWP PDEIS contains an analysis of potential hazards, potential modes of failure, and mitigation. Stable facility location, durable liner design, and sound construction techniques can be used to manage leakage and catastrophic failure to low probabilities. If an impoundment failure did occur, tailings could contaminate surface water and/or wetlands. The degree of damage would be related to:

- tailings composition
- proximity of the impoundment to a stream
- volume of tailings released
- discharge of impacted streams

The Failure Modes Effects Analysis (FMEA, Appendix H) quantified risk for various components or potential failure modes identified for the alternatives presented in the NWP-PDEIS (USDA Forest Service, 1997). Risk is defined as the likelihood of a failure occurring times the consequences to water quality and aquatic life. The likelihood or probability of occurrence of each potential failure mode was further quantified using a five level scale of annual probability (see Appendix H, Table H-2) ranging from negligible to high probability. Consequences to water quantity were categorized into five main levels (Appendix H, Table H-1) ranging from negligible to extreme. The consequence categories for water quantity were based on projected changes in ground water quality and several parameters (pH, SO4, metals, suspended sediment) and activities (mixed tailings release, pyritic tailings release, low pyritic tailings release) related to surface water quality.

The results of the FMEA demonstrate that risk varies substantially among alternatives (Appendix H, FMEA Summary Tables). Risk for various failure modes for all alternatives varies from very low likelihood with low consequences, to low likelihood with extreme consequences. The off site tailings disposal alternatives were rated as very low to moderate likelihood of failure occurrence with only low consequences with relatively few failure modes identified. The number of potential failure modes increased with other alternatives, as did the likelihood of occurrence and severity of consequences. The FEMA also includes a risk management plan which summarizes risk issues and potential compensation measures by NWP alternative.

During the post operations phase for the New World mine, Crown Butte would continue to treat and discharge Glengarry adit or upper Daisy Creek water and tailings creek water. Tailings impoundment water would mix with natural water and be released, either continuously or intermittently, as needed to meet the discharge permit conditions and limitations. At the end of operations, the tailings impoundment would be capped with four feet of rock, topsoiled, and revegetated. The tailings would be kept in saturated condition to avoid acid generation which could occur if the tailings become unsaturated.

The quality of ground water flow and springs from Henderson Mountain could be affected by the New World mine. Mine excavation, blasting, and backfilling would affect ground water within and downgradient of Henderson Mountain. Acid rock drainage might result from mine excavation due to exposure of sulfide minerals to water and oxygen. Blasting in the mine would temporarily increase nitrate and ammonia concentrations. Backfilling of the mine could be used to reduce the potential for formation of acid rock drainage. Methods for mitigating changes in ground water quality include removing the pyrite from the backfill, using a high density paste backfill, using bactericides to reduce acid generation, and plugging the mine adits at the end of the operation. Post operation sediment levels would gradually return to pre-mine levels as surface disturbance (roads and mine facilities) are reclaimed and revegetated.

Additional water quality effects in this Scenario could occur from a new open pit mine (probably in the Como and McLaren pit areas) or an underground mine. The additional impacts would depend on exact location, size, timing, mining technology, and mitigation used to deal with water resource impacts. Sediment effects would likely be cumulative to the sediment increases anticipated from the New World mine due to the longevity of some of the sediment sources (roads and facilities). Surface water chemistry effects would be less likely to be cumulative with New World mine discharge assuming discharge treatment is sufficient to meet Montana water quality standards and non-degradation constraints.

Additional cumulative effects could occur from historical or future activities. Past mining activities have altered water quality in study area streams, particularly Daisy Creek and Fisher Creek where low pH and concentrations of metals have severely degraded water quality. Reasonably foreseeable activities identified in Appendix C could be expected to result in cumulative surface water effects including: 1) reclamation of historical mining activities which could greatly improve water quality in study area streams and 2) reconstruction of Highway 212 from the Northeast Entrance to the Montana/Wyoming state line which could cause cumulative temporary sediment increases in Soda Butte Creek and the Clarks Fork River in addition to those resulting from mining activities.

Increasing recreational use and residential development in the Cooke City and Silvergate areas, as summarized in Appendix C, pose additional cumulative water quality impacts to Soda Butte Creek. These additional impacts could include accelerated sediment, particularly during construction of new homes or from new roads, septic systems, stormwater runoff, or litter and contaminates from streamside recreationists. Since residential development in the study area most frequently occurs on a single house or cabin basis, water quality effects of single units are minor and are not regulated except for building permits. Cumulative impacts of septic systems in Soda Butte Creek could become a problem unless a central sewage treatment facility is constructed. The overall potential of residential development in the study area, however, is constrained by limited suitable private land and domestic water.

Mitigation of mining effects on surface water would be required through a combination of several techniques. Surface water mitigation would also be interrelated to the amount and effectiveness of ground water mitigation. Surface water mitigation would need to incorporate all state and National Forest operating requirements and Best Management Practices (BMP's). All regulatory requirements would have to be met including water rights compact requirements, water quality standards, and non-degradation requirements.

Mine facilities site disturbance, clearing, tree removal, and site modification for mine facilities would be subject to Montana Forestry BMP's (Montana Department of State Lands, 1991) and Montana Streamside Management Zone Law and Rules (MT DSL, 1993). Disturbances on National Forest lands would be required to be conducted in accordance with USFS Soil and Water Conservation Practices (1988). These requirements include soil disturbance mitigation (waterbars, slash treatment), streamcourse and streamside protection, and disposal of hazardous or toxic material in a manner that would not pollute streams, lakes, or wetlands.

Road construction or reconstruction would be done in accordance with USFS (1988) and Montana Department of Natural Resources and Conservation (DSL 1991 and 1993) road BMP's. These BMP's include use of soil stabilization and revegetation techniques such as mulch, cut and fill slope netting, seed and fertilizer, straw bale sediment traps, silt fences, slash filter windrows, energy dissipation structures, culvert discharge control, culvert downspouts, temporary dikes, and berms. Minimal disruption of natural drainage patterns would be required with the use of ditch relief culverts with armored discharge points, and road drainage routed through streamside management zones, filtration fields, or other sediment settling structures. Mine facility roads no longer needed for mine operations would have cut-and-fill slopes recontoured, ripped and subsoiled, thoroughly drained, slash or mulched applied on the surface, and revegetated.

Surface runoff would be diverted with interceptor ditches on the upstream of plant and millsites, tailings impoundments, work camps, and waste water storage areas. This runoff would then be conveyed to original drainages. Surface runoff from mine facilities would be routed through sediment settling basins (not in stream channels) prior to disturbance. Final design of sediment control structures would require approval by Montana DEQ prior to construction. Stormwater runoff from disturbed areas would be regulated as part of the Montana Pollutant Discharge Elimination System (MPDES) discharge permit from the Montana DEQ. Runoff control ditches would be designed to safely pass a 100 year-24 hour discharge. Sediment settling ponds would be designed to contain the 25 year-24 hour runoff event.

Runoff from tailings impoundments would be contained in seepage control ponds that would include storage for the 100 year runoff event. Runoff from tailings impoundments would discharge only when a 100 year-24 hour flow event is exceeded. Final designs must be approved by the Montana DEQ before construction.

Adit flows from the underground mine and mill water would be stored in surface impoundments (e.g., in the New World mine tailings impoundment) with final treatment in a polishing pond for solids settlement and pH adjustment before discharge. If polishing pond water would not meet release criteria after settling, additional treatment would include various mechanical methods to ensure compliance with Montana water quality standards and Montana non-degradation water quality requirements.

The mitigation measures associated with the regulatory framework are in place to deal with potential adverse water quality effects (Montana and Wyoming water quality standards and non-degradation provisions, MPDES permits, stormwater discharge permits, road and mine BMP's and water protection design standards, reclamation requirements, wetland mitigation, etc.). If completely and successfully implemented, the measures would protect water resources to regulatory standards. However, although mine operations have made massive efforts in recent years to comply with environmental standards, monitor water quality effects, and have developed much of the existing science and technology to deal with mine related environmental problems, departures from standards have occurred in Montana. Most recent departures are small except for a large settlement in July 1996. A noncompliance penalty computation sheet, provided by the Montana Department of Environmental Quality, Hard-Rock Division, lists the noncompliance violations which have occurred in Montana mines regulated by the Hard-Rock Division and DEQ during the period of 1991-1996. The sheet lists 38 violations for 24 mining companies, most of which are slight to moderate in seriousness. During this period, the Hard-Rock Division has been criticized for not taking enforcement action against some mines for alleged water quality mine violations. Most of the violations were from failure to obtain proper permits, reclamation problems, exceeding the permit area, and minor spills. Four of the violations listed involved spills, leaks, or unauthorized discharges to surface water but all were listed as moderate harm ($100 to $300 fine). The compliance sheet does not list any MPDES permit violations. However, a July 1996 consent decree for two gold mines in northern Montana contains provisions for a water treatment plant, construction of water capture systems, and other water conveyance systems for proper wastewater discharge, and a program of tiered effluent limits. The settlement includes a two million dollar civil penalty for discharges without an MPDES permit.

In the study area, the extensive mineralization and acid generation potential, combined with the difficult operating conditions, result in a very challenging environment to extract mineral resources and comply with the strict non-degradation water quality standards. The EPA, during the PDEIS review of this EIS, questioned whether mining operations in the study area could meet the non-degradation water quality standards.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

Water quality effects could be similar in nature but reduced in extent to Scenario A-1 for an underground mine or surface mine if developed. The New World mine would not be developed and only minor amounts of exploratory drilling with potential for a small underground mine on private land would be anticipated. Past mining activities have altered water quality in study area streams, particularly Daisy Creek and Fisher Creek where low pH and concentrations of metals have severely degraded water quality.

Reasonably foreseeable activities identified in Appendix C could be expected to result in cumulative surface water effects including: 1) reclamation of historic mining activities which could greatly improve water quality in study area streams, and 2) reconstruction of Highway 212 from the Northeast Entrance of Yellowstone NP to the Montana/Wyoming state line which could cause cumulative temporary sediment increases in Soda Butte Creek and the Clarks Fork River in addition to those caused by mining activities.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

The water quality effects of this Scenario would be similar to Scenario A-1 but with less probability of the addition (to the New World mine) of effects from an underground mine and surface mine.

This Scenario would reduce the availability of adjacent federal land for NWP sites, and require facility development on private land and on existing, unpatented mining claims. This could result in more environmentally impactive locations for some of the NWP facilities, and increase the risk of adverse impacts to water quality compared to Scenario A-1.

Water quality of streams withdrawn from mineral entry are less likely to be affected by mining. Activity occuring adjacent to these lands could affect water quality on withdrawn streams.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

This Scenario has the greatest potential for water quality protection. Most of the anticipated indirect effects of this scenario would be improvements in water quality associated with reclamation of the existing historical mine disturbances, although water treatment facilities associated with new mine development would be unlikely. The withdrawal would reduce the probability of mining in the study area and the associated risk that water quality regulatory departures would occur. Water quality would be expected to be substantially improved in Fisher Creek with reduction or cessation in flow of the Glengarry adit. Cleanup would eventually increase pH and reduce the concentration of metals, sulfate, suspended solids, and dissolved solids. Continued reclamation of the McLaren pit would improve water quality in Daisy Creek and the West Fork of the Stillwater River. Sediment levels would decrease below current levels with rehabilitation of existing roads, exploration drill holes, and tailings.

Cumulative effects to water quality would occur from historical mining activities and from future residential and recreational development in the study area. Past mining activities have altered water quality in study area streams, particularly Daisy Creek and Fisher Creek where high pH and concentrations of metals have severely degraded water quality. Reasonably foreseeable activities identified in Appendix C could be expected to result in cumulative surface water effects including: 1) reclamation of historical mining activities which could greatly improve water quality in study area streams and 2) reconstruction of Highway 212 from the Northeast Entrance of Yellowstone NP to the Montana/Wyoming state line which could cause cumulative temporary sediment increases in Soda Butte Creek and the Clarks Fork in addition to those caused by mining activities.

Wetlands and Floodplains

Affected Environment

Wetlands are found throughout the study area, especially where ground water saturates portions of the lower mountain slopes. Wetlands are associated with numerous seeps and springs, with depressions accumulating snowmelt, and with streamside and lakeside areas. Map 3-1 shows the location of wetlands based on information from the NWP PDEIS, Section 9.2.1 but does not include wetlands for the entire study area. A substantial willow dominated wetland area occurs alongside Sodea Butte Creek and on Sedge Creek above Kersey Lake. During the NWP PDEIS review, the Army Corps of Engineers, Environmental Protection Agency (EPA), and National Park Service raised concerns about the adequacy of much of the wetland mapping. Additional wetland mapping work to address the concerns has not been completed since the New World Project EIS process was put on hold during August 1996.

Study area wetlands have been categorized using the US Fish and Wildlife Service's Cowardin (1979) classification into three systems: riverine, lacustrine, and palustrine. The channels of Fisher, Daisy, Miller, Soda Butte, Republic, Woody, Sheep, and Sedge creeks and the Clarks Fork, Broadwater, and Stillwater rivers are riverine systems. The named lakes like Kersey, Round, and Huckleberry, and the unnamed lakes and ponds, dominant in the northeast part of the study area, are lacustrine systems. The palustrine system includes herbaceous, shrub, and forested wetland types. Several dozen lakes and ponds (lacustrine wetlands) are located in the northeast part of the study area, on the southern edge of the Beartooth Plateau.

Herbaceous wetlands are often interwoven with shrub wetlands as willow and sedge meadows, such as in the upper Stillwater River below Daisy Creek, and numerous other valley bottoms in the study area. Some herbaceous wetlands are supported by deep organic soils and are referred to as fens. The wetland maps for the NWP PDEIS, Section 9.2 display several areas of fens in Fisher Creek and a few in upper Soda Butte Creek. An interagency field trip in July 1996 found several more fens not on the map. Fens are usually located in areas of cold ground water upwelling that create a cool, moist, micro-environment which retards decomposition and favors accumulation of organic material or peat. Fens are generally considered to be unique, although they are common within portions of the Greater Yellowstone Area. Fen peatlands are favorable potential sites for geo-chemical enrichment (accumulation of metals and nutrients) due to the concentration of organic matter. Forested wetlands in the study area are dominated by subalpine fir with forested riparian streamside wetlands including Engelmann spruce.

Wetland functions include: ground water recharge and discharge, flood flow alteration, sediment stabilization, sediment and toxicant retention, nutrient removal and transformation, production export of organic material, wildlife diversity and abundance, and aquatic diversity and abundance. Wetlands are also valued for recreation and aesthetics.

Wetlands can accumulate minerals, metals, and toxicants. The role of the wetlands in water quality changes in the two assessment area streams most impacted by historic mining, Daisy and Fisher creeks, has not been quantified. In both creeks, streamflow is generally confined to channel and limited overbank flooding occurs onto the herbaceous/shrub wetlands which can accumulate metals.

Waters of the U.S.(33 CFR 328.3) include riffle and pool complexes as well as wetlands, both of which are considered special aquatic sites. Riffles are important sources of stream enrichment with atmospheric oxygen by turbulent mixing over the cobble/gravel substrates. Because of their oxygen rich waters and ideal substrate for aquatic lifeforms, riffles are major stream sources of aquatic insects and periphyton. Pools are excellent habitat for fish and other aquatic life and provide slow current areas where sediments can settle out of the water column. All study area streams have riffle and pool complexes with the exception of upper Daisy Creek.

Study area floodplains are bottom lands adjoining streams formed by overbank flows depositing silt, sand, gravel, and cobble. Floodplain regulations usually focus on floodplains occupied by 100 year flood events. Study area floodplains are generally narrow streamside zones, ranging from a few feet in small streams, 50 to 75 feet in Fisher Creek, and up to 300 feet in some reaches of the Broadwater River, Clarks Fork River, Soda Butte Creek, and the Stillwater River. Floodplains in the assessment area are usually either forested with Engelmann spruce and subalpine fir, or meadows with willow shrubs and sedges, and are typically also riverine wetlands.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

Mine development in the study area would fill some wetlands. Access roads, millsite and adits, tailings impoundments, and other mining facilities can be located to minimize wetland impacts but no practical alternatives to some wetland filling are available. In addition, mine development would discharge some fill material into study area streams, riffle and pool complexes, and floodplains.

The NWP PDEIS, Section 9.2, estimates that mine development could fill from 21 to 81 acres, depending on the alternative. Most of the potential impacts are to herbaceous and shrub wetlands which would be filled by the tailings impoundment and associated diversions channel in Fisher Creek. The NWP PDEIS, Section 9.4, discloses that mine area streams could be affected by facility construction or tailings impoundments, estimated at 1,600 to 14,700 linear feet of stream depending on the alternative. In addition an estimated 28,300 to 30,900 feet of small ephemeral or intermittent drainages (in Fisher Creek and the East Fork of Miller Creek) were considered potentially at risk due to dewatering from intercepted ground water. The NWP PDEIS, Section 9.5, estimated that discharge of dredged or fill material into riffle and pool complexes would fill from 600 to 2,700 feet in Fisher Creek. Floodplains in Fisher Creek would also be filled in some New World mine alternatives.

Scenario A-1 could also include additional wetland filling and/or dwatering impacts from a surface mine or additional underground mine.

Wetland disturbance would require mitigation of unavoidable direct and indirect adverse wetland effects by replacing the wetland functions lost as well as the wetland area lost. Scenario A-1 could have a high impact on wetland ground water discharge function, sediment stabilization, wildlife diversity and abundance, and a low impact of production export. Mitigation which cannot be accomplished on site and in kind would be considered an irretrievable commitment of resources. The Army Corps of Engineers (COE) and the EPA, which oversee the wetland protection provisions of the Clean Water Act, prefer wetland impacts be avoided if possible, then further minimized, and finally unavoidable effects compensated by restoration or creation of replacement wetlands and other waters of the US. A minimum of one to one acreage replacement and no net loss of wetland function and values would be required for a mining company to obtain a Section 404 permit from the COE. The NWP PDEIS, section 9.6, lists 180 acres of potential wetland mitigation sites (on and off site) which have potential to compensate wetland acreage and function (primarily metals attenuation, wildlife habitat, ground water discharge, and sediment retention). A detailed wetland mitigation plan, which must be approved by the COE, was not developed for the New World mine pending identification of a preferred alternative in the NWP FEIS.

The COE, NPS, and EPA, in a review of the NWP PDEIS (April-July, 1996) did not concur that wetland function had been sufficiently identified. A multiple agency field review during July 1996 raised several concerns about the appropriateness and adequacy for wetland mitigation of several of the potential NWP mitigation sites. At the time of cessation of work for the NWP PDEIS (August 1996), wetland mapping refinement, more detailed function identification, more wetland mitigation site identification, and mitigation plan development was needed before approval for a 404 wetland fill permit from the COE for the New World mine was feasible. Any future mine development under Scenario A-1 (New World mine or potential surface mine or additional underground mine) would require additional wetland analysis to augment the wetland information in the NWP PDEIS.

Past mining activities have affected study area wetlands, particularly riverine (herbaceous and shrub) wetlands in Daisy Creek and Fisher Creek. Reclamation of historic mining areas would reduce metal loading and improve water quality in downslope and downstream wetlands, streams, and riffle and pool complexes. Reconstruction of Highway 212 from the Northeast Entrance of Yellowstone NP to the Montana/Wyoming state line would cause cumulative impacts to wetlands, and ephemeral, intermittent, and small perennial streams by filling wetlands.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

The New World mine and other potential mineral development on property interests acquired by Crown Butte would not occur because of the NWM Agreement. The area of highest mineral potential, which includes wetlands in Miller and Fisher Creek, would no longer be available for mining. If an additional underground mine is developed on remaining lands available for mining the effects could be similar to those described for scenario A-1 depending on the location and size of a future mine. 17,760 acres of federal land remain open to filing of mining claims. Development of these lands could affect wetlands.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

Wetlands and floodplains effects of Scenario B-1 are similar to those described for Scenario A-1 because of anticipated development of the New World mine. The area of highest mineral potential, concentrated in the Miller Creek and Fisher Creek drainages, remains available for mining. Wetlands located on the 17,760 acres of federal land immediately subject to the withdrawal would not be directly affected by future mining. These wetlands could be affected by water quality changes on adjacent lands open to mining.

This Scenario would reduce the availability of adjacent federal land for NWP facility sites, and require facility development on private land and on existing, unpatented mining claims. This could result in more environmentally impactive locations for some of the NWP facilities, and increase the risk of adverse impacts to wetlands and floodplains compared to Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

Scenario B-2 has the greatest potential for wetland/floodplain/pool and riffle complex protection. Only minor amounts of mineral exploration would occur but no foreseeable mine on federal lands. Fill of any waters of the US or special aquatic sites, such as wetlands, riffle and pool complexes, or floodplains would not likely occur as a result of mining. Existing wetland functions would not be affected by mining activities. Reclamation of historical mining disturbances would probably require filling minor amounts of herbaceous wetlands, particularly in upper Fisher and Daisy Creeks but could improve water quality inflows to wetlands. Reconstruction of Highway 212 from the Northeast Entrance of Yellowstone NP to the Montana/Wyoming state line would cause cumulative impacts to wetlands, and ephemeral, intermittent, and small perennial streams.

Conclusion

The Scenarios evaluated in this EIS portray various levels of mine exploration, mining, and/or existing mine impacts which could occur depending on the amount of land available for mining. If the NWM Agreement is implemented, there would be much less potential for mining. Withdrawal of the federal lands would reduce the risk of adverse effects to water, wetlands, floodplains, and air quality. The regulatory framework is in place to deal with potential adverse environmental effects (Montana and Wyoming water quality standards and non-degradation provisions, MPDES permits, stormwater discharge permits, Yellowstone NP/MT water rights compact, Yellowstone Controlled Groundwater area, road and mine BMP's and water protection design standards, COE Section 404 permit, wetland mitigation requirements, reclamation requirements, air quality standards, etc.). If completely and successfully implemented, water and air resources would be protected to regulatory standards. Although mine operations have made massive efforts in recent years to comply with environmental standards, monitor water and air effects, and have developed much of the existing science and technology to deal with mine related environmental problems, departures from standards have occurred. The withdrawal alternatives would reduce the probability or risk that water and air regulatory departures would occur.

Mining poses five main water resource issues including streamflow reduction, ground water quality change, legal availability of water, surface water quality, and wetlands. Mines would intercept various levels of ground water in the fracture flow dominated mineralized areas. Depending on the effectiveness of ground water mitigation measures to reduce ground water interception (grouting, backfill, bulkheads, etc.), downgradient ground water flow could be reduced to some degree.

Minor streamflow reductions could result which would require augmentation to protect existing water rights, particularly in Soda Butte Creek which is protected with the NPS/MT water rights compact. Mining operations have the potential to change ground water quality which could affect surface water quality when ground water emerges in streams, springs, or seeps.

Ground water change can be managed with underground mitigation but may require surface treatment. Ground water quality effects are difficult to predict in advance and may not be evident until several years after a mine is in operation.

Surface water quality is closely regulated with storm water permits for non-point discharges, BMP's and engineering/project design standards, and MPDES permits for excess water (point) discharges. Careful implementation of mine operation, monitoring, and treatment techniques will be required to meet all of the water quality standards and non-degradation requirements in the study area.

The study area has a large and diverse wetland resource which is regulated by wetland protection provisions in the Clean Water Act (CWA). Mining operations have potential to fill area wetlands and floodplains by surface disturbance associated with development of mine facilities (roads, millsites, tailings impoundments, waste rock storage areas, workcamps, etc.). Wetland mitigation requires mapping of all wetland areas, determination of associated wetland functions, and rehabilitation or replacement of filled wetlands and displaced wetland functions. The study area has very limited availability of appropriate wetland mitigation sites which may necessitate wetland mitigation activities outside of the study area. Additional wetland mapping, function identification, and mitigation planning will be required for any potential mine in the study area to obtain a COE 404 permit for wetland impacts.

AQUATIC RESOURCES

Substantive Changes Between the Draft EIS and Final EIS

In the Affected Environment, Physical Environment—Clarks Fork of the Yellowstone River Drainage section, under the subheading "Sediment," a sentence was added indicating fires in 1988 have also increased sediment yield to Fisher Creek and the Clarks Fork River.

In the Affected Environment, Physical Environment—Soda Butte Creek Drainage section, under the subheading "Water Quality," additional information was added concerning nutrient loads in the creek.

In the Affected Environment, Physical Environment—Soda Butte Creek Drainage section, under the subheading "Sediment," additional information was added concerning metals-ladened sediments eroding from the historical McLaren tailings.

In the Affected Environment, Aquatic Biology—Clarks Fork Yellowstone River Drainage section, under the subheading "Algae," additional information was added concerning periphyton indices for Lady of the Lake Creek.

In the Affected Environment, Aquatic Biology—Clarks Fork Yellowstone River Drainage section, under the subheading "Invertebrates," additional information was added to explain why aquatic invertebrates are commonly used to monitor stream systems.

In the Affected Environment, Aquatic Biology—Clarks Fork Yellowstone River Drainage section, under the subheading "Fish," additional information was added to explain why fish are routinely used to monitor stream systems.

In the Affected Environment, Aquatic Biology—Soda Butte Drainage section, under the subheading "Algae," a statement was added indicating elevated nutrient levels are likely the result of commercial and residential sewage drainfields throughout Cooke City.

A statement has been added to the second paragraph of the Environmental Effects explaining why the effects analysis is general rather than quantitative.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Water Quality Changes," a statement was added describing changes in water quality associated with the New World Mine Project.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Water Quality Changes," a paragraph was added to discuss the possibility of development of a centralized sewage treatment facility and its potential effects to Soda Butte Creek.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Water Quality Changes," a section was added describing a Failure Modes Effects Analysis (FMEA) which helps characterize mining-related risk to aquatic resources.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Effects to Fish," a sentence was added indicating the clean-up of the McLaren tailings was not part of CBM's reclamation plan.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Effects to Fish," the effects of a catastrophic failure of an impoundment in Soda Butte drainage were clarified.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Effects to Aquatic Insects," a sentence was added discussing the effects to algae and insect communities if a sewage treatment plant were constructed in Cooke City.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Effects to Yellowstone National Park for Scenarios A-1 and A-1," two sentences have been added regarding the probability of ground or surface water contamination.

In the discussion of the effects of Alternative Scenario B-2, a sentence was added regarding the likelihood of failure occurrence and severity of consequences to water quality and aquatic life.

In the discussion of the effects to Yellowstone National Park, under the subheading "Cumulative Effects Common to All Scenarios," information regarding Soda Butte Creek has been added.

In the Conclusion, a sentence was added indicating existing poor water quality is the primary factor limiting aquatic biota in most area streams.

Introduction

Issues

The lead agencies' analysis focuses on specific issues with the potential to affect aquatic habitat and aquatic biota.

These issues are changes in physical habitat; changes in streamflow; changes in sediment loads due to potential future mining activities; and changes in water quality due to potential future mining activities.

Affected environment descriptions, both physical and biological, are tiered to the primary issues of concern. Descriptions are displayed by drainage for streams within the analysis area. Resource descriptions are general, not technical or highly site specific, because of the programmatic nature of the decision to be made. Descriptions of existing physical conditions include general stream channel and habitat characterizations, water quality, sediment, and streamflow. Existing biological communities, including aquatic algae, aquatic invertebrates, and fish are also summarized. For a more comprehensive discussion of the affected environment the reader is referred to *Chapter 8 - New World Project PDEIS* or the supporting *Aquatic Resources Technical Report - New World Project*. Existing physical and biological conditions then provide a basis from which to evaluate the effects of each alternative.

Causes of Change

The physical and chemical attributes of a stream provide the habitat framework for the development of the biological community. Physical attributes (*e.g.*, stream gradient, substrate characteristics, channel dimensions) and chemical attributes (*e.g.*, water quality) are basically products of the climate, geology and soils, topography, vegetation, hydrology and land use of a watershed. Changes in one or more characteristics due to future mining could potentially result in changes in the physical and chemical attributes of a stream, and lead to changes in the quality of habitat for aquatic life.

Affected Environment

Study Area

Three drainages and their streams originate within the proposed withdrawal area:

- Clarks Fork of the Yellowstone Drainage; including Fisher Creek, Lady of Lake Creek, the Broadwater River, and the Clarks Fork of the Yellowstone River (Clarks Fork) to the Wyoming border.
- Soda Butte Drainage; including Miller Creek, Woody and Republic creeks, Sheep Creek, and Soda Butte Creek into Yellowstone NP.
- Stillwater Drainage, including Daisy Creek, and the Stillwater River to the Goose Creek confluence.

Physical Environment

Clarks Fork of the Yellowstone River Drainage

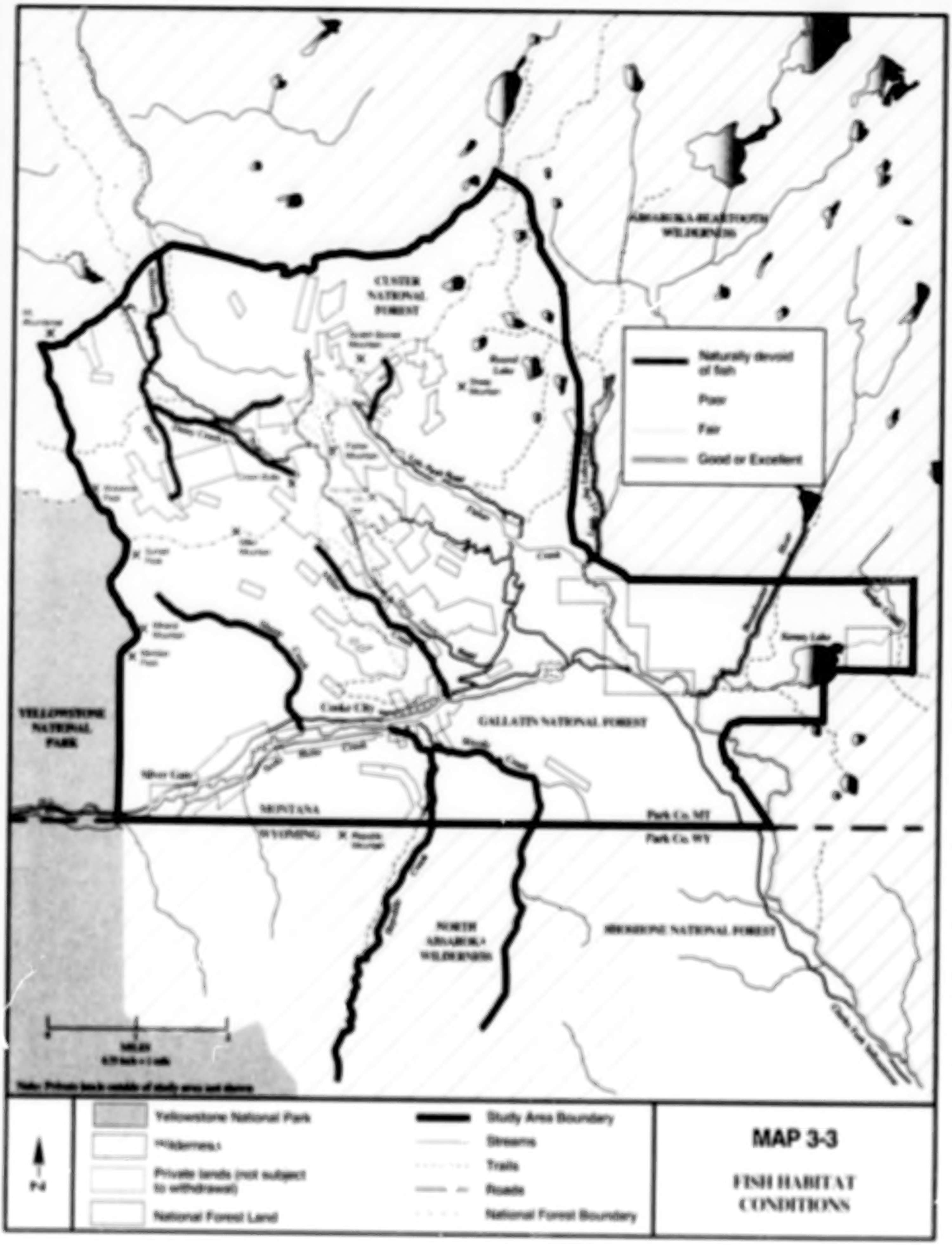
General Stream Channel and Habitat Characterization. Fisher Creek is a perennial first and second order mountain stream with headwaters originating below Fisher Mountain, Scotch Bonnet Mountain, and Lulu Pass. The entire stream is within the study area. The channel has moderate to steep gradients (*e.g.*, 2-10%) with primarily boulder and large cobble substrates, but gradients and substrates vary among site specific reaches. In general, Fisher Creek has a stable plan and profile with low to moderate sensitivity to disturbance (*i.e.*,changes in streamflow or sediment). The lower reach of the stream near its confluence with the Clarks Fork River is less stable and more sensitive.

Physical habitat conditions for fish (*e.g.*, availability of high quality pools and instream cover, and the amount and quality of spawning habitat) in Fisher Creek are rated poor (Map 3-3; see also Aquatic Technical Report, New World Project (NWP)). Adult and juvenile habitat (*i.e.*, pools) throughout the upper reaches is lacking, and would limit the number of fish it could support if water quality improved. Spawning habitat quality and availability would not limit recruitment in the upper reach. Habitat is more abundant for all life stages throughout the lower reach above the Clarks Fork River confluence primarily due to increased woody debris in the channel. However, the quality of habitat throughout this more sensitive reach has been degraded due to excessive fine sediment deposition from historical watershed disturbances.

The Broadwater River is a major second order tributary to the Clarks Fork and originates within the A-B Wilderness. The upper higher gradient reach is stable with predominately boulder substrates. The lower reach has a gentle gradient with predominately cobble and gravel substrates and is more sensitive to changes in sediment loads. Except for the 1988 fires, little watershed disturbance has occurred and habitat quality is reflective of natural conditions. Habitat quality for all life stages of fish is rated good to excellent (Map 3-3).

The Clarks Fork River is a second order stream originating at the confluence of Fisher and Lady of the Lake creeks (the river is formally called the Clarks Fork of the Yellowstone River and informally called the Clarks Fork).

The upper reach of the Clarks Fork (i.e., the first 1.5 miles) within the study area has a moderate gradient and is boul-



MAP 3-3

FISH HABITAT CONDITIONS

der-dominated. Some large wood is present in the channel, which increases habitat diversity and complexity. This upper reach has a stable plan and profile with a low sensitivity to disturbance. In general, habitat conditions are rated fair (Map 3-3) for juvenile and adult fish. However, many high quality pools are void of fish, which suggests that some other factor may be limiting the number of fish in this upper reach. Habitat for fry and spawning adults is limited.

Just prior to the Broadwater River, the Clarks Fork is more sinuous and less stable. Habitat conditions are rated fair (Map 3-3). High sediment loads from Fisher Creek have degraded habitat quality for all life stages in that reach.

The Clarks Fork below the Broadwater River is a third order stream with much higher streamflow. For several miles beyond the Kersey Lake Trail footbridge, the river progresses through a series of slightly to moderately confined high gradient reaches with intermittent reaches confined by bedrock. Habitat conditions are generally rated fair, with the overall lack of high quality pools limiting the number of adult and juvenile fish the reach can support.

Water Quality. The existing water quality of Fisher Creek is dominated by effects of low pH and the presence of heavy metals, resulting from historical mine drainage and naturally occurring exposed mineralized areas that generate acid. The upper reaches of Fisher Creek are highly acidic, with pH values often less than 4. Concentrations of heavy metals, including cadmium, copper, and zinc, routinely exceed chronic aquatic life standards (Chapter 7, NWP PDEIS). Further downstream, water quality improves as a result of mixing with clean water tributaries and ground water; however, aquatic life standards are routinely exceeded. Poor water quality throughout Fisher Creek precludes fish from inhabiting the stream.

Water quality in the Broadwater River is excellent, with concentrations of all constituents below Montana Water Quality Standards (Crown Butte Mines, Inc. 1992, Vol. 4A, Appendix B, Attachment B).

Water quality in the upper Clarks Fork River appears better than in Fisher Creek, primarily due to dilution with Lady of the Lake Creek, but is still affected by historical mine drainage. While pH is relatively neutral, water hardness and alkalinity values are low. These conditions can enhance the toxicity of metals. Copper concentrations routinely exceed water quality standards for aquatic life in the upper Clarks Fork River (Chapter 7, NWP PDEIS). Below the Broadwater River confluence, concentrations of copper, lead, aluminum, and zinc exceeded Montana Water Quality standards during high spring flows (Chapter 7, NWP PDEIS). Wyoming water quality standards were exceeded for several metals just upstream of Pilot Creek (Chapter 7, NWP PDEIS).

Recent studies show that bioaccumulated metal concentrations in fish are high in the upper Clarks Fork River below Fisher Creek. Concentrations of toxic metals were significantly lower in fish collected further downstream in the Clarks Fork River near Pilot Creek. Bioaccumulated metals, especially copper and cadmium, have been shown to cause toxic injury to fish and may be adversely affecting fish populations in the upper Clarks Fork River (Aquatic Technical Report, NWP).

Sediment. Historical disturbances, including roads, the 1988 fires, and mining activities, have increased sediment yield in Fisher Creek and the Clarks Fork River above natural conditions (Chapter 7, NWP PDEIS). Fires in 1988 have also increased sediment yield to Fisher Creek and the Clarks Fork River. Sediment yield increases have caused excessive fine sediment accumulations in lower gradient, sensitive reaches of those streams resulting in degraded habitat quality for fish (Chapter 8, NWP PDEIS). Minimal anthropogenic watershed disturbances have occurred in the Broadwater River (*e.g.*, mining or roads), thus sediment yield is expected to be near natural levels.

Streamflow. Peak discharge in all study area streams normally occurs during spring's snowmelt runoff and declines rapidly, remaining low for the majority of the year. Under existing hydrologic conditions, minimum low flows for all streams are a very small percentage of mean annual flow (*i.e.*, ranging from 1.2 to 6.7 percent). Based on theoretical relationships between habitat suitability and minimum streamflow requirements, existing habitat suitability for trout during baseflow periods severely limits trout abundance in those streams that support, or could support, a fishery (Chapter 8, NWP PDEIS).

For Fisher Creek, the maximum recorded discharge was 17.9 and 112.2 cfs for upper and lower reaches respectively (Chapter 7, NWP PDEIS). Minimum discharge reported was 0.1 and 0.4 cfs in upper and lower Fisher Creek. For the Clarks Fork below Fisher Creek, maximum and minimum streamflow measured was 273.3 and 1.0 cfs respectively. Unlike Fisher Creek, which tends to gain discharge along its course, the Clarks Fork loses water between its origin and the confluence with the Broadwater River. Maximum recorded high and low flows for the Broadwater River are 275.7 and 38.0 cfs respectively (Crown Butte Mines, Inc. 1992, Vol. 4A, Appendix B).

Soda Butte Creek Drainage

General Stream Channel and Habitat Characterization. Miller Creek is a perennial stream with a moderate gradient, and is riffle-dominated with infrequently spaced pools. The stream has a low sensitivity to disturbance with stable banks. Lower Miller Creek becomes more confined and its gradient increases as the stream valley narrows. Boulders and large cobbles are the dominate substrate. High gradients in the lower reach prevent upstream migration of fish into the stream, and therefore the stream is naturally void of fish. Nonetheless, habitat conditions in the watershed are sufficient for a small resident salmonid fishery to exist.

Soda Butte Creek, from its headwaters near Colter Pass to the McLaren tailings near the Miller Creek confluence has a moderate gradient, primarily cobble and gravel substrate, and is stable with a low sensitivity to disturbance. It is riffle-dominated with frequently-spaced pools formed by instream woody debris. Habitat quality for fish and aquatic life in this reach is rated fair (Map 3-3).

From the McLaren tailings near the Miller Creek confluence through Cooke City to the Woody Creek confluence (about 3/4 mile), Soda Butte Creek has a moderate gradient and infrequently-spaced pools formed by woody debris. Riparian vegetation is sparse throughout the tailings area. Stream substrates are coated with hydrated iron oxides resulting from acid drainage from the McLaren tailings. Overall habitat quality for fish and aquatic life is rated poor because of persistent acid drainage problems (Map 3-3).

Below the Woody Creek confluence, Soda Butte Creek meanders through a willow-shrub valley (about 4 miles). The stream is more sinuous with a lower gradient and has cobble, gravel, sand, and silt substrates. It is less stable and sensitive to changes in streamflow or sediment. Extremely high levels of fine sediment enter the stream from Woody Creek, much of which is deposited on medial and lateral point bars. Overall, habitat condition for fish and aquatic life is rated fair (Map 3-3). Abundant spawning habitat exists; however, spawning habitat quality is reduced due to excessive fine sediment accumulations. Infrequently-spaced pools formed by woody debris and lateral scour provide limited habitat for juvenile and adult fish.

Woody Creek is a perennial second order stream originating in the North Absaroka Wilderness, WY, and enters Soda Butte Creek at the west end of Cooke City, MT. A water fall, approximately 100 ft. high, exists about 1.5 miles from its confluence with Soda Butte Creek. From the falls downstream the stream flows through a steep canyon and is very high gradient and stable. Pools scoured out of bedrock provide some habitat for fish. Above the falls, the valley opens into a high elevation cirque basin. Here the stream is less confined, very unstable and the channel is predominately riffle with few pools. High water and sediment discharges resulting from frequent high intensity rainfall events have formed a channel with little structural complexity or habitat diversity for fish. Thus, habitat conditions for fish are rated poor.

Republic Creek is a perennial first order tributary to Woody Creek. Its lower reach is stable and flows through a steep canyon with moderate gradient. Boulders and woody debris provide suitable habitat for trout. Higher in the watershed the stream flows through a cirque basin with lower gradient. The stream is very unstable and downed trees, boulders and some undercut banks provide limited habitat for trout.

Sheep Creek is a first order perennial tributary to Soda Butte Creek and enters approximately 1 3/4 miles upstream from Silver Gate, MT. In general, the stream has a moderate gradient, and is stable with primarily cobble and boulder substrate with a low sensitivity to disturbance. Approximately 1,000 feet of stream below the highway has habitat conditions suitable for trout. Upstream from the highway, gradient increases and habitat suitability declines.

Water Quality. Compared with Fisher and Daisy creeks, Miller Creek is relatively unaffected by historical mining activities. Based on limited data, pH appears relatively neutral and metal concentrations in Miller Creek are low, often below analytical detection limits (Hydrometrics, 1995). However, chronic aquatic life standards are occasionally exceeded for copper (Hydrometrics, 1995). Data collected by Del Nimmo suggests that copper concentrations may be affecting biological communities in the stream (Nimmo, personal communication 9/18/96).

Upper Soda Butte Creek above the Miller Creek confluence also tends to have relatively good water quality. Trace elements are primarily below analytical detection limits and physicochemical parameters indicate water is neutral and moderately hard. As Soda Butte Creek enters Cooke City and flows past Woody Creek, runoff from the historical McLaren tailings, abandoned mines at the base of Republic Mountain, and historical tailings at the mouth of Woody Creek increases metal concentrations and decreases pH (Hydrometrics 1995, Van Gosen, USGS, personal comm.). Residential drainfields along Soda Butte Creek throughout Cooke City and Silver Gate likely increase nutrient loading to the stream. Periphyton indices for Lower Soda Butte Creek (downstream of the McLaren tailings) suggest higher levels of nutrients compared with upstream sites. Data are not available to describe water quality in Sheep Creek.

Bioaccumulated metals in fish collected in Soda Butte Creek below Woody Creek are similar to concentrations found in fish from the upper Clarks Fork River site (Aquatic Technical Report - NWP). Bioaccumulated metals, especially copper and cadmium, at concentrations found, have been shown to cause toxic injuries to fish and may be adversely affecting fish populations in Soda Butte Creek.

Sediment. Like the Clarks Fork drainage, existing roads and historical mining activities have contributed to elevated sediment loads in streams throughout the upper Soda Butte Creek drainage. Woody and Republic creeks, in particular, contribute extremely high levels of sediment to Soda Butte Creek. The Woody Creek watershed has a high percentage of extremely erosive soil comprised of glacial till derived from volcanic rocks (Shovic et. al. 1988). High snowmelt rates and summer thunderstorms readily erode the steep volcanic cirque headwalls and scarps to form a dense dendritic drainage pattern of intermittent channels that carry high sediment loads. For example, sediment discharge from one intermittent trough wall tributary to Woody Creek was measured at 114,960 tons/day after a heavy day-long rain (Shovic et. al. 1988). These high sediment loads reduce channel stability and habitat quality for all life stages of fish in Soda Butte Creek. Furthermore, metals-laden oxidized sediments readily erode from the historical McLaren tailings and are deposited downstream within Soda Butte Creek and along its floodplain. These sediments have been shown to have high concentrations of copper, zinc, iron, lead, and arsenic (Meyer 1993) and are likely causing toxic injury to fish and other aquatic life in Soda Butte Creek.

Streamflow. For Miller Creek, maximum and minimum recorded streamflows between 1989 and 1993 were 48.7 and 0.43 cfs respectively. In Soda Butte Creek above the Miller Creek confluence, streamflows ranged from 1.4 to 29.4 cfs. Discharge increases substantially beyond the Woody Creek confluence with Woody Creek contributing approximately 70 percent of the flow. No discharge data is available for Sheep Creek.

Like streams in the Clarks Fork drainage, habitat suitability for trout in streams throughout upper Soda Butte drainage is reduced due to extensive low flows.

Stillwater River Drainage

General Stream Channel and Habitat Characterization. Daisy Creek is a perennial first order mountain stream originating from springs, seeps, and some flow from the McLaren pit below Fisher Mountain. It is a high gradient, stable stream with predominately boulder and cobble substrates. Substrates are coated with hydrated iron oxides resulting from acid drainage from the McLaren pit. Habitat conditions for fish are poor due to steep gradients and poor water quality (Map 3-3).

The Stillwater River below Daisy Creek meanders through a willowed valley bottom for about 1 mile to the A-B Wilderness boundary. The low gradient channel is moderately stable with cobble, gravel, sand, and silt substrates. Hydrated iron oxides coat the stream bottom and degrade habitat for aquatic life. From the wilderness boundary downstream to the Goose Creek confluence the stream flows through a steep narrow canyon and over several falls that are barriers to upstream fish movement. Channel stability is rated high and substrate is primarily boulder. Habitat conditions for fish are rated poor due to steep gradients and poor water quality. The most-downstream barrier falls is located about 200 yards upstream from the Goose Creek confluence. No fish inhabit the Stillwater River above the barrier falls, and this portion of the drainage is considered naturally void of fish. Thus, issues regarding water quality, sediment, streamflow and associated direct effects on aquatic habitat and biota pertaining to the Stillwater River upstream from the falls are related primarily to aquatic insects. Habitat conditions for fish and other aquatic life improve downstream from Goose Creek as water quality improves and gradients are less steep.

Water Quality. Like Fisher Creek, Daisy Creek water quality is characterized by low pH and elevated heavy metal concentrations from the McLaren pit and other historical mining disturbances. More alkaline water in Daisy Creek may moderate the toxic effects of some metals; however, data suggest aluminum, copper, manganese, and zinc may regularly exceed water quality criteria.

The Stillwater River is less severely affected than Daisy Creek (Chapter 7, NWP PDEIS). Above the Daisy Creek confluence, the Stillwater River has fairly neutral pH with moderate hardness and alkalinity. Physiochemical parameters change as water from Daisy Creek enters the stream; pH, hardness, and alkalinity values all decline. Trace metal analyses indicated that copper and zinc may occasionally exceed water quality criteria below Daisy Creek.

Sediment. Historical mining activities, primarily the McLaren pit, have contributed to elevated sediment loads in Daisy Creek and the Stillwater River (Chapter 7, NWP PDEIS). High levels of fine sediment deposited in the upper low gradient reach of the Stillwater River further degrades habitat quality and reduces the biological health of that reach. Less fine sediment is deposited in the reach throughout the wilderness because of higher gradients.

Streamflow. Daisy Creek is a perennial stream that drains the Fisher Mountain, Crown Butte, and Daisy Pass area. Small tributaries, influx from ground water, and surface flow from the historical McLaren pit contribute to the Daisy Creek discharge. Near the headwaters of Daisy Creek, streamflow measurements have ranged from 0.1 to 12.5 cfs (Chapter 7, NWP PDEIS). Farther downstream flows in Daisy Creek ranged from 0.4 to 57.0 cfs.

Several large springs and tributaries, including Daisy Creek, form the headwaters of the Stillwater River. Discharge records show flows range from 1.7 to 157.6 cfs (Chapter 7, NWP PDEIS).

Aquatic Biology

Clarks Fork Yellowstone River Drainage

Algae. Aquatic algae are often used to describe the biological condition of stream systems because:

- they can be indicators of short-term effects due to their rapid reproduction rates and short life cycles;
- they can be directly affected by physical and chemical factors;
- they are relatively easy to sample;
- standard methods for community evaluation are available; and
- these algal communities can be sensitive to pollutants (Plafkin et al., 1989).

Algae in mountain streams are basically represented by two groups, soft-bodied algae and diatoms, collectively referred to as periphyton. The periphyton community for many streams in the study area were assessed using the methods described by Bahls (1993), and results are described in detail in the Aquatic Technical Report for the New World Project. Basically, indices calculated for each stream provide a basis for assessing the degree of impairment.

Overall impairment for periphyton from Fisher Creek and the Clarks Fork River were rated moderate to severe, possibly as a result of elevated levels of heavy metals. In addition, periphyton communities in these streams also may be limited by physical habitat conditions typically found in high mountain streams, including low nutrient concentrations, flushing flows from storms and snowmelt, and cold temperatures (Aquatic Resources Technical Report, NWP) (Map 3-4). Periphyton indices for Lady of the Lake Creek also indicated a stressed community. Since metal concentrations have not been reported to affect this system, low values are most likely the result of natural stressors described above. Periphyton indices have not been calculated for the Broadwater River.

Invertebrates. Aquatic invertebrates are also commonly used to monitor stream systems because:

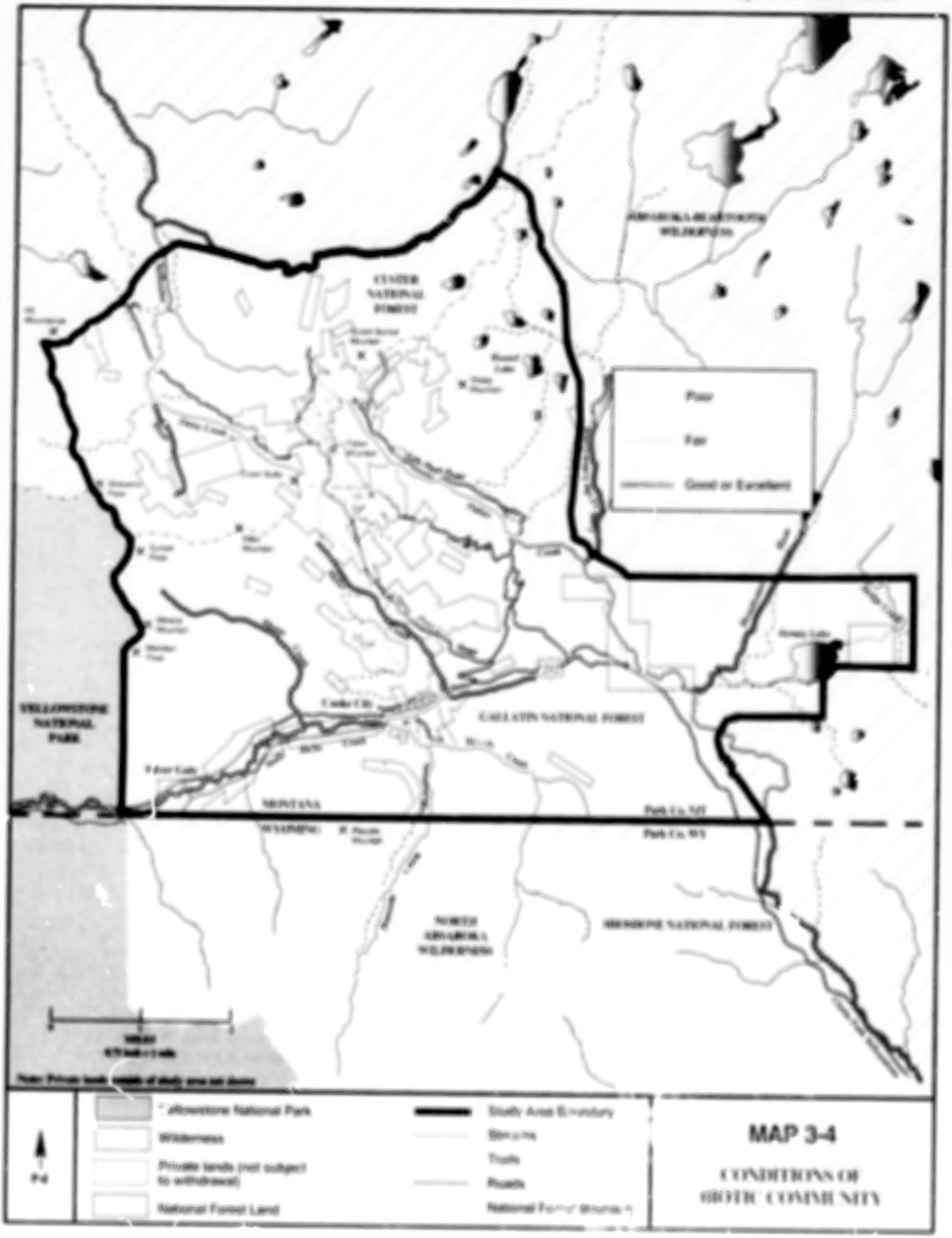
- they have limited migration patterns or sessile mode of life, and thus are particularly well suited for assessing site-specific impacts;
- they integrate the effects of short-term environmental variation, and sensitive life stages respond quickly to stress;
- they are relatively easy to identify to family and lower taxonomic levels;
- sampling is relatively easy, and has no detrimental effect on the resident biota;
- they serve as a primary food source for fish; and
- they are more abundant than fish (Plafkin et al., 1989).

Sensitive species in mountain stream communities generally include mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera), which are often referred to as the "EPT" taxa. Impairment of aquatic communities can be assessed by comparing conditions at potentially affected sites to conditions at nearby "unaffected" sites. Sites considered to be unaffected often have greater total abundance and number of species, including the sensitive EPT taxa, when compared to sites affected by heavy metals.

The agencies used three metrics to assess the existing conditions of aquatic invertebrate communities in the study area (total abundance, Heptageniidae abundance, and EPT taxa). These three metrics have been reported to be particularly useful for assessing metals contamination (Clements, 1994; Clements and Kiffney, 1995).

Aquatic invertebrates in upper Fisher Creek reflect stressed conditions, with very low values for all metrics. In comparison, metrics calculated for Scotch Bonnet Creek, a nearby tributary relatively unaffected by historical mining, are considerably higher, although the values still reflect the harsh conditions often found in high altitude streams (Aquatic Resources Technical Report, NWP). Further downstream, data indicate partial recovery, as shown by increased total abundance and EPT taxa. However, these data still indicate that the invertebrate community is under moderate stress. The invertebrate community, while exhibiting greater abundance, is composed largely of orthoclad chironomids; insects often considered metal tolerant.

Lady of the Lake Creek exhibited moderate densities and number of taxa. However, the Heptageniidae abundance and number of EPT taxa were higher than Fisher Creek sites, indicating a community typical for a high mountain stream subject to physical habitat limitations.



MAP 3-4

CONDITIONS OF BIOTIC COMMUNITY

The Clarks Fork river data suggest a trend of improved conditions from the upstream to downstream, with higher values for each of the metrics evaluated. Differences between upstream and downstream locations may in part be the result of Fisher Creek inflow and/or changes that are often associated with natural longitudinal variation in stream systems. No invertebrate data is available for the Broadwater River.

Fish. Fish are routinely used to monitor stream systems because:

- they are good indicators of long-term effects and broad habitat conditions;
- they are at the top of the aquatic food chain and tend to integrate effects of lower trophic levels;
- they are consumed by humans, making them important subjects in assessing contamination;
- they are relatively easy to collect and identify to species level, and the environmental requirements of individual species are comparatively well known; and
- aquatic life uses (water quality standards) are typically characterized in terms of fisheries (Plafkin et al., 1989).

An assessment of fisheries resource health is also imperative for this project, considering the high recreational value of fisheries resources within and outside the study area. The size, structure, and relative condition of fish populations allow determination of habitat condition, as well as inferences about lower trophic levels. Fish populations in most study area streams were surveyed by the Montana Department of Fish, Wildlife and Parks (MDFWP) and the U.S. Forest Service. In addition, extensive fish population data have been collected for Soda Butte Creek within Yellowstone NP by the U.S. Fish and Wildlife Service.

No fish have been captured from Fisher Creek. Following their 1990 survey, the MDFWP concluded that Fisher Creek continues to be affected by acid rock drainage, but that improved potential for fish habitat and populations would likely develop should acid drainage be controlled. Lady of the Lake Creek has moderate to high densities of brook trout of various age classes and in fair condition (Aquatic Resources Technical Report - NWP).

The upper Clarks Fork River contains low densities of brook trout, with several age classes represented. Rainbow trout are also present. Brook trout condition factors were low. Farther downstream near the sawmill, trout densities increase two-fold over the upstream site, with several age classes represented. Just prior to the Broadwater River, another two-fold increase in brook trout density was observed over the sawmill section (a three fold increase over the uppermost site). Trout condition improved substantially over the uppermost site. The longitudinal increase in trout density along with improved condition indicates improvement in biological productivity from the Clarks Fork origin to its confluence with the Broadwater River. No fisheries data are available for the Broadwater River.

In the Clarks Fork above Pilot Creek low densities of predominately rainbow trout were found. Low trout densities were probably due to limited habitat availability, since trout condition was good.

Soda Butte Drainage

Algae. The periphyton communities of Miller Creek showed moderate impairment (Aquatic Resources Technical Report - NWP). This is attributed to heavy metals, which have been shown to occasionally exceed water quality criteria and/or physical habitat limitations (i.e., scouring flows, low temperatures, limited nutrients).

Upper Soda Butte Creek (above the McLaren tailings) showed only minor overall impairment, with values for some metrics indicating a relatively healthy periphyton community. Indices for lower Soda Butte Creek (downstream of the McLaren tailings) suggested higher levels of nutrients and siltation compared with upstream sites. Elevated nutrient levels are likely the result of commercial and residential sewage drainfields throughout Cooke City.

No periphyton data are available for Woody, Republic or Sheep creeks.

Invertebrates. Metric scores for Miller Creek, including Heptageniidae abundance, and the number EPT taxa, indicate that Miller Creek invertebrate communities are composed largely of sensitive species, even though water quality criteria are sometimes exceeded (Aquatic Resources Technical Report - NWP). Unpublished data by Nimmo et. al. Show that species richness and EPT indices for lower Miller Creek are more similar to study sites on Soda Butte Creek immediately below the McLaren tailings.

Aquatic invertebrate communities in upper Soda Butte Creek are abundant and composed of sensitive taxa, as shown by high Heptageniidae abundance and a high number of EPT taxa. Immediately downstream from the McLaren tailings all index values are reduced. While these metrics are reduced, the invertebrate community is still comprised largely of sensitive species. Over half the total number of taxa are EPT taxa, and other metric values are comparable to upstream sites. Farther downstream near the Park boundary, total abundance and Heptageniidae abundance increase dramatically, and EPT taxa also increase. Increased total abundance at stations downstream from Cooke City may be the result of increased nutrients from drainfields, which was also evident in algae samples.

Despite community values similar to upstream sites, benthic invertebrates collected near the McLaren tailings and at sites downstream from historical mine tailings in the Woody Creek drainage have been shown to have elevated whole-body metal concentrations.

No quantitative invertebrate data exists for Woody, Republic, or Sheep creeks. However, a visual survey of Sheep Creek showed a diverse and abundant macroinvertebrate community (Shuler personal observation).

Fish. Miller Creek is naturally void of fish due to high gradients in the lower section. No fish have been collected in this stream. Fish also are not abundant in upper Soda Butte Creek (above the McLaren tailings). A population survey in 1994 in the upper reach yielded low densities of brook and cutthroat trout in fair condition (Aquatic Resources Technical Report - NWP). Below the tailings downstream to Woody Creek, a recent survey yielded 64 cutthroat trout with at least four age classes represented. Moderate densities of cutthroat trout were found below Woody Creek, but few age-1 fish were sampled suggesting poor recruitment.

The primary factor limiting trout production adjacent to and immediately below the McLaren tailings is toxic concentrations of heavy metals. Channel instability, sedimentation, and lack of pools also contribute to a repressed trout population above the Park boundary.

Population surveys at the northeast entrance to the Park indicate that, in general, these sections maintain relatively healthy populations of cutthroat trout but are limited by channel instability and sedimentation. Metal contaminants from the McLaren tailings and other historical mine discharges in the drainage may also be adversely affecting fish populations. Although, population data suggests that some recovery has occurred since the last McLaren tailings reclamation effort.

Fish population surveys of Woody and Republic creeks yielded no fish. Poor habitat conditions, sedimentation, channel instability, and extreme flash flood events likely prevent fish from inhabiting those streams. Low densities of cutthroat trout are present in the lower reach of Sheep Creek (below the highway), but fish are absent from the upper reach.

Stillwater Drainage

Algae. Periphyton in Daisy Creek indicated moderate impairment probably due to heavy metal and physical habitat limitations. One location on the Stillwater River upstream from the Daisy Creek confluence indicated only minor overall impairment. A more recent study showed moderate impairment downstream from Daisy Creek, with recovery not evident until downstream from Goose Creek (Aquatic Resources Technical Report - NWP).

Invertebrates. Sampling of Daisy Creek shows that metric scores are very low (no Heptageniidae and only 2 EPT taxa), indicating Daisy Creek invertebrate populations are under severe stress. Data from the upper Stillwater River indicate that invertebrate communities upstream from the Daisy Creek inflow are relatively abundant, diverse, and composed of sensitive taxa (Aquatic Technical Report - NWP). Downstream from Daisy Creek, Heptageniidae abundance and the number of EPT taxa (as well as other metrics) decline substantially. Only limited recovery is evident when evaluating metric scores for sites farther downstream. The communities in Goose Creek appear abundant and diverse with a high number of EPT taxa and abundant Heptageniidae mayflies.

Fish. Several reaches of the Stillwater River above the wilderness boundary have been electrofished with negative results, confirming that this section is naturally void of fish. Two 500-foot sections, one above and one below the Goose Creek confluence, were electrofished. Habitat conditions for these two reaches is nearly identical, yet significant differences in trout density were found. Above the confluence, only six fish were found in fair to poor condition. Below the confluence 37 fish were found (29 brook trout and 8 cutthroat trout) in fair to good condition. No fish population data have been collected for the Stillwater River below the Goose Creek confluence for about 15 miles.

Threatened, Endangered and Sensitive Species

There are no Threatened or Endangered fish species present within the project area. Recent studies reveal that "genetically pure" Yellowstone cutthroat trout inhabit Soda Butte Creek above Ice Box Canyon a short distance downstream of the Park boundary and in the Stillwater River near Goose Creek (Aquatic Technical Report - NWP). Below Ice Box Canyon, electrophoretic analysis indicated that cutthroat trout are introgressed with rainbow trout. Pure Yellowstone cutthroat trout are listed as a "Sensitive Species" by the Forest Service due to low population numbers, limited distribution, and recent declines across their former range.

Genetic analysis of cutthroat trout from Soda Butte Creek above the barriers in Ice Box Canyon also revealed the presence of a relatively new intrusion of non-native Westslope cutthroat trout. Intense field surveys during 1994 were unable to locate a possible tributary source for the Westslope strain. For the purposes of this analysis, the lead agencies assumed Yellowstone cutthroat populations upstream from the barriers are genetically pure.

Recent genetic analysis of cutthroat trout from the mouth of Goose Creek, near its confluence with the Stillwater River, identified eight genetically pure and two hybrid Yellowstone cutthroat. Analytical uncertainty indicated that the two hybrids may, in fact, be pure. Analysis of additional fish from the Stillwater River is necessary to resolve the uncertainty. For the purposes of this analysis, the lead agencies assumed the Stillwater River Yellowstone cutthroat population is genetically pure.

The Wyoming Game and Fish Department does not believe that genetically pure Yellowstone cutthroat trout inhabit the Clarks Fork River. However, no genetic testing has been done.

Environmental Effects

The following analysis describes anticipated direct, indirect and cumulative effects to fish and other aquatic life and the habitat those populations are dependent upon. Effects are described for each alternative in the three primary areas of concern -

- changes in streamflow
- changes in sediment concentrations; and
- changes in water quality

Where possible, these analyses rely on effects analyses written for the New World Project. It is assumed that the effects of a new underground mine, if developed, would be similar in terms of the relative magnitude and direction of change. Thus, ranges of potential effects developed for the NWP are used as a relative basis for projecting effects of a new mine in the study area. Consequently, the effects analyses are general, not quantitative, because of the programmatic nature of the decision to be made. More quantitative and site specific analyses would require a specific plan of operations from which more specific and quantitative effects could be evaluated.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

The effects analysis assumes that the New World mine would be developed. Development of one additional underground mine and one open pit mine is more speculative. As such, the aquatic effects described under this alternative are based on anticipated effects from development of the New World Project (see Aquatic Resources Technical Report - NWP). If additional mines are developed, the effects would be in addition to those described for the NWP, depending upon the location and size of any future mine.

Streamflow Changes

Mining could lead to reductions instream flows due to ground-water interception or water diversion. Using the proposed New World mine, as an example, streamflow reductions during a 100 year low flow event (a worse case scenario) to area streams ranged between 4-31% depending on specific alternative and stream (see Surface Water Chapter, NWP PDEIS). Percent flow reductions would be much less during normal water years. Percent flow reductions would also be less for higher order streams (i.e., the Broadwater River, the main Clarks Fork River, and lower Soda Butte Creek) because of the higher flow volumes inherent to larger streams.

Effects to Fish: As discussed previously, fish are historically absent from Miller Creek, upper Sheep Creek and the upper Stillwater River due to natural fish migration barriers. Fish are also absent from Woody and Republic creeks due to naturally occurring severe habitat limitations. Thus, flow reductions would potentially affect only aquatic insects in those streams.

Hackman and Raleigh (1982) and Raleigh (1982) characterized habitat suitability for both cutthroat and brook trout during low streamflow as a function of the mean annual base flow (MABF) percent of mean annual flow (MAF). Habitat suitability is optimal when the percentage value is 50 or higher, but decreases proportionately when the percentage is less than 50. Likewise, Tennant (1976) developed a method for assessing relative habitat health for trout during low streamflow periods based on the same MABF/MAF percentage calculation. According to Tennant (1976), habitat health varies from optimum, when the percent value is >66, to severely degraded when the percent value is <10. These theoretical relationships provide a relative index of habitat change that is useful for comparing minimum streamflow reductions for each alternative. The key ecological relationship evaluated is the relationship between excessively low flows and the amount and quality of pools and instream cover for trout.

Cumulative habitat losses due to streamflow reductions for all mines during a 100 year drought event are estimated to range between 4-31%. Habitat reductions would be less during normal water years. Habitat suitability and availability would increase as streamflow increased during spring and summer months. Thus, habitat reductions would only occur during the baseflow periods, and would subside as flow increased. The highest percent reductions, and thus potential for adverse affects, would occur in smaller headwater streams. This is because existing MABF/MAF percentages, and thus low flow habitat suitability, are already low (i.e., 1.6-6.7%; Aquatic Technical Report, NWP PDEIS). Streamflow reductions would have less effect on fish habitat in higher order streams because habitat availability is generally higher during low flow periods (e.g., 20% for the Clarks Fork River; Aquatic Technical Report NWP). As such, flow reductions would have the greatest potential adverse effects in Fisher Creek, the upper Clarks Fork River, and headwater reaches of Soda Butte Creek. These headwater reaches currently support a fishery, or have potential to support a fishery (i.e., Fisher Creek).

Flow reductions in Fisher Creek could further limit the streams potential to support a recolonizing fish population, especially in lower gradient reaches. Fisher Creek is currently void of fish due to poor water quality. Pools throughout the lower gradient reaches are generally shallow, low quality pools with potential to provide only marginal habitat for trout. Flow reductions would also reduce pool habitat quality and suitability in the Clarks Fork River above the Broadwater River confluence because residual pool volume is currently reduced due to excessive fine sediment accumulations. Habitat changes due to flow modifications in the Broadwater and lower Clarks Fork rivers would be minimal.

If the predicted worst case (4-31%) flow and habitat reductions were temporary and occur once every 100 years, minimal impacts to fish populations are expected. If flow reductions of that magnitude were more frequent (e.g., occurred annually), then annual habitat losses could result in continual fish population declines.

For Soda Butte Creek above the Miller Creek confluence, minimum low flow reductions could reduce residual pool volume and habitat availability. Below the Miller Creek confluence to Woody Creek, poor water quality would still be the primary factor limiting fish. In Soda Butte Creek above the Park boundary, flow reductions would likely have minimal effect on habitat quality because the MABF/MAF percentage is relatively high compared to other smaller order streams in the area. At the Park boundary, mining companies would be required to replace any flow losses so habitat reductions during low flows would not occur.

Effects to Aquatic Insects: Streamflow effects on aquatic insects were evaluated in terms of their potential to be affected by flow changes. This included a review of the scientific literature for the effects of increasing and decreasing flows on aquatic insects.

Predicted streamflow reductions would be unlikely to cause long term effects on aquatic invertebrate and algae populations in any stream in the study area. Habitat constriction in 100-year low flow conditions might occur, but sufficient flow would remain and continue to support aquatic life. Aquatic invertebrate populations are robust even under minimal flow conditions (Hynes, 1970) and would be expected to quickly recolonize stream margins that may be temporarily dewatered during a 100 yr. drought. Aquatic insects have been shown to be able to recolonize disturbed stream reaches rapidly from tributary sources, upstream unaffected reaches, or deeper alluvial areas of the channel.

Sediment Changes

Construction of the New World mine could result in sediment increases. If additional mineral development occurs, the cumulative or additive nature of sediment increases would depend on the timing of development and the effectiveness of reclamation and revegetation efforts of each mine. For the New World Mine, estimated sediment yield increases are 31-140% over natural levels (or 31-61% over existing levels), depending on stream and specific alternative. If an additional underground mine is developed, sediment yield increases are assumed to be within the same relative magnitude as the New World mine. If a new open pit mine is developed, additional sediment yield increases would occur. The greatest increase in sediment would occur during initial construction periods for each mine when soils in disturbed areas would be loosely packed, unvegetated and very erosive. After construction, sediment would decline as soils compact and areas become vegetated. The recovery period would depend on elevation, soil characteristics and effectiveness of BMP's. Assuming some recovery occurs between mine development, projected sediment yield increases for each mine would not be additive, but residual sediment increases would be cumulative.

Effects to Fish: Two specific effects of sediment on trout habitat have been recognized:

- filling interstitial spaces in spawning gravel by depositing fine sediment, thus reducing or preventing further flow of water through the gravel and reducing the supply of oxygen to the embryos or sac fry; and
- entrapment of emerging fry if an armor of consolidated sediment is deposited on the surface of the gravel.

Increasing proportions of fine sediment in substrates have been associated with reduced intra-gravel survival of embryonic brook trout (Hausle and Coble, 1976), rainbow trout (Witzel and MacCrimmin, 1981; Irving and Bjornn, 1984), and cutthroat trout (Irving and Bjornn, 1984), which are fish species known to inhabit the Clarks Fork River, Soda Butte Creek, and the Stillwater River. Increases in fine sediment also can directly limit survival-to-emergence by entrapping emerging fry (Koski, 1975). However, a potentially greater influence on survival by increased sediment deposition is the decrease in dissolved oxygen concentration coupled with reduced intra-gravel water flow (Chapman, 1988; Sowden and Power, 1985).

Because fish are absent from Miller Creek, upper Sheep Creek, the upper Stillwater River, and Woody and Republic creeks, sediment effects would be limited to aquatic insects in those streams.

Using methods described by Stowell et. al. (1983), a relationship between percent sediment yield over natural and fine sediment accumulation in spawning gravels was established for streams within the Gallatin NF (see Aquatic Technical Report for NWP). Estimated sediment yield increases during the initial construction period could result in additional fine sediment accumulations in spawning gravels of 7-24% over existing levels. Sediment yield and subsequent instream accumulations would decline as disturbed areas become revegetated.

The existing sediment concentrations in spawning gravels of area streams are 19.6% for Fisher Creek, 27.8% for the Clarks Fork River, and 25.3% for lower Soda Butte Creek (Aquatic Resource Technical Report, NWP).

Based on studies that evaluated sediment effects on trout embryo survival, high mortality of brook trout embryos can occur when fine sediment concentrations approach 30 percent, and survival of cutthroat and rainbow trout embryos declines sharply above 20 percent fines. Thus, predicted sediment yield increases and subsequent deposition in spawning gravels could adversely affect trout reproductive success in area streams that support a fishery. The magnitude of effect would be dependent upon existing sediment concentrations, actual increases in sediment, species composition, and site specific channel characteristics that determine the streams potential to flush additional sediment. Higher gradient reaches of streams would accumulate less sediment because of their higher capacity to flush sediment. Lower gradient reaches, like some reaches of Fisher Creek and the upper Clarks Fork River, would likely accumulate more sediment. Sediment increases and subsequent effects on fish reproduction in Soda Butte Creek below the Woody Creek confluence could occur. However, effects would be difficult to measure or attribute to mining because sediment increases would be small relative to existing high sediment loads from Woody Creek.

Effects to Aquatic Insects: Increased sediment loads during initial construction could result in temporary reductions in aquatic biota. Aquatic insects often drift downstream when turbidity increases, and deposition of fine sediment in streambeds has been associated with decreases in aquatic invertebrates, often resulting in reductions in sensitive EPT taxa, percent mayfly abundance, and diversity (Aquatic Resources Technical Report, NWP). However, aquatic invertebrate communities of streams generally recover quickly from short-term sediment increases. Spring snowmelt runoff in mountain streams has been shown to remove deposited sediment, allowing benthic invertebrates of streams affected by construction-related sediment increases to recover after construction was completed and areas revegetated (Aquatic Resources Technical Report, NWP). Recovery potential would depend on the effectiveness of sediment control and actual decrease in sediment production. However, post-construction sediment levels would not be expected to return to pre-mine levels.

The aquatic insect communities currently inhabiting Woody and Republic creeks are expected to reflect the extremely high sediment concentrations and unstable flows that naturally occur in those streams, although no quantitative insect data is available to verify this claim. If this is true, then mine-induced sediment increases and associated effects to aquatic insects would likely be difficult to measure in those streams. Likewise, the existing fine sediment concentration in the upper Stillwater River is extremely high (i.e., 51% Aquatic Technical Report, NWP). Therefore, mine-induced sediment increases and associated effects to aquatic insects for that reach would likely be difficult to measure.

Water Quality Changes

It is assumed that mine discharge water for a potential future mine would be required to meet discharge permit conditions and limitations, Montana water quality standards, and non-degradation limitations. The Forest Service could not select an alternative for a future mine EIS that would not meet these standards. Various studies of metal toxicity to aquatic life have been used to estimate potential effects of elevated metal concentrations and form the basis for water quality criteria established by state and federal agencies. Therefore, it is also assumed that discharge permit requirements would protect aquatic life. In order to meet discharge permit requirements, a mine would likely be required to actively treat discharge water. Because water quality in Daisy and Fisher creeks is currently very poor, with effective treatment there is potential to either improve or at least maintain existing water quality conditions in those streams and the streams they flow into. The effects of water quality improvements would depend on the relative change of total metal loads in streams receiving treated discharge water. For the New World Mine Project, significant improvement in water quality and reduced metal concentrations would occur under the various alternatives. For example, copper, which is the primary toxic metal of concern to aquatic life in area streams, would decrease from a toxic level of 0.022 mg/l to a non-toxic level of 0.0005 mg/l in the upper Clarks Fork River. It is assumed that active treatment would be required during the life of the mine. A more passive treatment plan could be implemented after closure. Furthermore, with the New World mine, other remediation efforts would occur in order to be in compliance with the Clean Water Act. These water quality improvements would improve aquatic health.

Furthermore, mine development, along with the projected residential development, could increase the need for a centralized sewage treatment facility, although no written proposals were submitted or agreed upon to construct a centralized sewage treatment plant for Cooke City. In fact, the CBM Plan of Operations proposed constructing a workcamp with facilities to treat its own sewage. However, additional mine and residential development could increase the likelihood that a centralized sewage treatment facility would be constructed. If a sewage treatment plant were constructed, then existing nutrient enrichment of Soda Butte Creek could be reduced.

With any mine, but especially metalliferous mines with a high acid generating potential, there are risks and uncertainties associated with unforeseeable and/or uncontrollable ground or surface water contamination. These risks may include:

- uncertainties associated with ground-water flow and contamination
- uncertainties associated with the effectiveness of mitigation to control ground-water contamination
- effectiveness of water treatment facilities
- risk of impoundment and other facility failures

It is difficult to quantify risk for specific mining proposals, and near impossible to quantify risk for speculative future mine developments. However, some generalities regarding risk can be made for this proposal. The probability of unpredictable contamination is in part directly related to the probability of future mine development, because risks can never be completely mitigated. It is also dependent upon the type of mine (i.e., surface or underground) and scale of operations. For example, it is reasonable to assume that if an alternative reduces the probability of mine development, then it would also reduce the probabilities and risk of unpredictable contamination or facility failure. Likewise, the risk of ground-water contamination would be higher for a large scale underground mine than for a small one.

With this Scenario, maximum mineral development is anticipated as all lands remain available for mining. The New World Project would be developed and additional mines are possible. There would be an increased probability of ground or surface water contamination due to unpredictable or unforeseeable mine facility failures, or ground water becoming acidic. If ground or surface water contamination occurred, then aquatic life could be adversely affected.

A Failure Modes Effects Analysis (FMEA), Appendix H helps characterize mining-related risk to aquatic resources. For the purpose of this programmatic analysis, the FMEA serves as an example of the types of failure modes, likelihood, and consequences that could be expected from mineral development in the area. The FMEA quantified risk of failure of various components or potential failure modes identified for the eight alternatives presented in the NWM-PDEIS. Risk is defined as the likelihood of a failure occurring, multiplied by the consequence to water quality and aquatic life. The likelihood or probability of occurrence of each potential failure mode was further quantified using a five level scale of annual probability (see Table H.2, Appendix H) ranging from negligible to high probability. Consequences to water quality and aquatic life were also categorized into five main levels (Table H-1, Appendix H) ranging from negligible to extreme consequences. The consequence categories for aquatic life were based on projected levels of copper criterion exceedence for different failures and associated effects to aquatic life (see Table 17, USDA, FMEA 1997). A binning procedure was then used to evaluate risk for all potential failure modes for all alternatives according to the likelihood of a failure occurring and what the consequence would be.

The results of the FMEA demonstrate that risk varies among alternatives. Risk for various failure modes for all alternatives varies from a very low likelihood with low consequences, to low likelihood with extreme consequences depending on the alternative. The off-site tailings disposal alternative yielded very low to moderate likelihood of failure occurrence with only low consequences, with relatively few failure modes identified. The number of potential failure modes increased with other alternatives, as did the likelihood of occurrence and severity of consequence.

Effects to Fish: Many studies have demonstrated that elevated concentrations of copper, cadmium, lead, and zinc may cause a number of toxic injuries to fish and aquatic life (Aquatic Resources Technical Report, NWP). As previously discussed, the existing aquatic insect and fish communities in some streams are currently being adversely impacted by acid rock discharge from historical mining operations. If water quality were improved due to active treatment, especially in Daisy Creek and the upper Stillwater River, or Fisher Creek and the upper Clarks Fork River, then biological health of those streams would also improve. The magnitude of improvements would depend on the magnitude of metal load reductions, especially copper. If metal concentrations were reduced to meet aquatic life standards as projected for the NWM project, then significant improvements could occur, and fish could potentially repopulate lower reaches of Fisher Creek. Bioconcentrations of metals in fish tissues in the upper Clarks Fork River would also be reduced, potentially resulting in increased reproductive success, growth, and survival of fish in that reach. Existing water quality in the Broadwater River does not limit fish production, so assuming water quality did not change, no effects would occur.

Bioconcentrations of metals in fish tissues in Soda Butte Creek would likely remain high because of ongoing metal leaching problems associated with the McLaren tailings and other non-point sources at the mouth of Woody Creek. Clean-up of the McLaren tailings was not part of CBM's reclamation plan.

If water quality were degraded due to ground or surface water contamination, then biological health could be impaired. The magnitude and duration of biological impairment would depend on the degree of contamination, mode of failure, and effectiveness of clean-up and/or control. Effects to fish and other aquatic life could range from no effect to long term catastrophic effects, depending on failure modes and location to different streams. If a facility failure occurred, effects would likely persist until clean-up and control. Fish populations would eventually recover and re-populate a stream once conditions improved. However, a catastrophic failure (i.e., dam erosion or spillway failure) of an impoundment in Soda Butte drainage could induce a shock loading with extreme consequences to the Yellowstone cutthroat trout population in Soda Butte Creek above the Park boundary. That population is geographically isolated from other genetically pure populations, so there would be no recruitment source. Geographically isolated populations have a low resilience to catastrophic disturbance. If ground-water contamination occurred, control would be difficult and perhaps not feasible. The likelihood of this occurring varies from low to high depending on NWM project alternatives and/or facility locations for other mine development. Depending on the magnitude of contamination, effects to fish could range from no effect to long-term persistent reductions in growth, reproductive success and survival.

Effects to Aquatic Insects: Potential water quality improvements associated with active treatment could also result in higher densities and increased diversity of aquatic insects, especially in Daisy Creek, the upper Stillwater River, Fisher Creek, and the upper Clarks Fork River.

As with fish, effects to aquatic insects from a facility failure or ground-water contamination could also range from no effect to long-term persistent effects. Because aquatic insects can recolonize impacted streams after clean-up, the effects of facility failure would not be irreversible. Ground-water contamination could result in decreased abundance and diversity.

If a sewage treatment plant were constructed in Cooke City, then existing nutrient enrichment of Soda Butte Creek could be reduced. Algae and insect communities in the stream would not reflect unnatural organic enrichment, and productivity would decline.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

Streamflow, Sediment, and Water Quality Changes:

Potential for ground water contamination and mine facility failure described for Scenario A-1 and associated risks to aquatic ecosystems would still exist, but at a much lower level than for Scenario A-1, for two reasons. First, under this Scenario the probability and extent of mine development is greatly reduced. Second, because the area of highest mineral and acid generating potential is excluded from mining, potential for ground or surface water contamination would be less. If ground water contamination or increased sedimentation did occur, then adverse effects to aquatic life could negate any cumulative improvements resulting from reclamation efforts.

The NWM Agreement primarily includes lands within the Fisher and Miller Creek drainages. Other drainages in the study area remain available for mineral entry.

Reclamation plans commensurate with the NWM Agreement (i.e., reclamation of the McLaren and Como pits, closure of the Glengarry Adit), or other remediation of historical mining disturbances via enforcement of the Clean Water Act, would also improve water quality and reduce sediment yield. Water quality is expected to be improved in Fisher Creek through a potential combination of source water controls and potential treatment of the remaining adit flow from the Glengarry adit.

Effects to Aquatic Life: Because water quality is the primary factor limiting fish and aquatic life in Fisher Creek and the upper Clarks Fork River, water quality improvements via active treatment and reclamation could improve the health of aquatic ecosystems. Passive treatment prescriptions (e.g., rerouting water from sulfide mineral sources, liming of acidic soils, etc.) would improve water quality and have long term, permanent benefits. However, total metal load reductions may be less than actively treating water through a water treatment plant, which would occur if a mine like the New World mine was developed. Active treatment would likely be temporary during the life of the mine, and passive prescriptions would likely be employed after closure.

Adverse affects due to streamflow reductions and increased sediment could be comparable to those described for the NWP

Effects to Yellowstone National Park for Scenarios A-1 and A-2

Soda Butte Creek at the northeast entrance to the Park, below Ice Box Canyon, and near the Lamar River has a relatively healthy population of cutthroat trout. Above Ice Box Canyon, Yellowstone cutthroat trout are genetically pure and below the Canyon they are introgressed with rainbow trout. Factors limiting trout production in Soda Butte Creek in the Park include overall lack of adult habitat, channel instability problems, and sedimentation. Past overfishing and existing elevated metal concentrations from the McLaren tailings and other metal sources at the mouth of Woody Creek may also limit trout populations in the Park. Trout density has increased since the last McLaren tailings reclamation effort in the early 1990's.

If a new mine (or mines) were developed, no losses in streamflow at the Park boundary would be allowed. Therefore, no streamflow affects to aquatic life would occur.

If sediment increased in Miller Creek or upper Soda Butte Creek due to mine construction, there would be some potential to adversely affect aquatic life in lower Soda Butte Creek in the Park. However, given the extremely high natural sediment loads entering Soda Butte Creek from Woody and Republic Creeks, it would be difficult to attribute any adverse affects to mine development. Sediment increases from mine development would be a very small percentage (e.g., <1%) of the total sediment yield in Soda Butte Creek. There is concern (comments received by Yellowstone NP) that sediment generated from a mine area could be toxic (e.g., metal laden) and therefore more detrimental to aquatic organisms than the natural sediments introduced throughout the basin.

Existing water quality problems in Soda Butte Creek are primarily the result of metals leaching from the McLaren tailings and other sources near Woody Creek. No additional reclamation is known to be planned for those areas with or without the NWM Agreement. Therefore, no decrease in metal loads would occur. However, if a new mine (or mines) were developed, the potential for ground and/or surface water contamination in Miller Creek (or Sheep Creek) would increase, thereby increasing the potential for adverse effects to aquatic life in Soda Butte Creek. Based on the FMEA for the NWM project, the likelihood of ground or surface water contamination occurring is generally low, but varies with alternative. If a catastrophic failure occurred, most likely associated with an impoundment facility located in the Soda Butte drainage, then the genetically pure population of Yellowstone cutthroat trout above Ice-Box Canyon could be permanently lost. The likelihood of this occurring is characterized as very low.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to [illegible]en mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

Streamflow, Sediment and Water Quality Changes:

As no mineral exploration or development could occur on 17,760 acres withdrawn, there would be a reduced risk of adverse effects from mining to streamflow, water quality, fish, and aquatic life. While some of the withdrawn land has high mineral potential, the withdrawal does not have an immediate effect on the highest potential mineral area near Fisher and Henderson Mountain. If the NWM Agreement is not implemented, then the amount and probability of future development is the same as described for Scenario A-1. Streamflow reductions, sediment increases and water quality changes associated with mining on private and unpatented mining claims, including the NWP, are described under Scenario A-1. Lands that are available for mining are concentrated in the Fisher Creek and Miller Creek drainages. The mineral withdrawal reduces the likelihood of mining in the Woody, Republic, Sheep Creek, and portions of the Stillwater River.

Effects on Aquatic Life: The direct, indirect and cumulative effects of future mining on private and unpatented mining claims in this area, including the New World mine, are described under Scenario A-1.

This scenario would reduce the availibility of adjacent federal land for NWP facility sites, and require facility development on private land and on existing, unpatented mining claims. This could result in more environmentally impactive locations for some of the NWP facilities, and increase the risk to water quality and aquatic habitat compared to Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

Because no mines are anticipated, no mining related impacts (*i.e.*, streamflow reductions, sediment increases, water quality degradation) would occur. Thus, no adverse affects to aquatic habitat or life would be expected. Some sediment increases could be caused by exploration activities on private land. Because water treatment facilities associated with mine development would not be constructed, there would be less potential for active treatment of Glengarry Adit and other point or non-point sources of acidic water. This assumes that a potential future mine would construct a water treatment facility.

Without mine development, risks of ground or surface water contamination due to failure of various structural facilities (e.g., tailings impoundments) and unpredictable or uncontrollable ground-water contamination would be eliminated.

Until planned reclamation occurs, the existing condition of aquatic communities would not change for area streams. Poor water quality would continue to be the primary factor limiting aquatic life in Daisy Creek, the upper Stillwater River, Fisher Creek, and Soda Butte Creek from the tailings downstream to the Woody Creek confluence. Bioaccumulated metals in fish residing in the upper Clarks Fork River and in lower Soda Butte Creek would continue to exert some limiting influence on growth, survival and reproductive success.

As previously discussed, planned reclamation commensurate with the NWM Agreement will further improve watershed health (e.g., reduce sediment yield and improve water quality), but to an unknown extent. Water quality improvements will subsequently improve the biological health of area streams to the extent reclamation efforts are successful. Water quality is expected to be substantially improved in Fisher Creek through a potential combination of source water controls and potential treatment of remaining adit flows. Because water quality is the primary factor limiting fish and aquatic life in Fisher Creek and the upper Clarks Fork River, water quality improvements would greatly offset any habitat constriction that may occur due to reduced streamflow. Improved water quality would eventually result in increased aquatic insect and algal diversity and biomass in Fisher Creek, the upper Clarks Fork River, Daisy Creek, and the upper Stillwater River. Depending on the effectiveness of reclamation, insect and algae communities could be more comparable to those found in nearby relatively unaffected streams, like Lady of the Lake Creek. Aquatic insect communities in the Broadwater River, and Sheep Creek would likely be unchanged because reclamation is not planned in those watersheds.

Water quality in Soda Butte Creek below the McLaren tailings would remain poor because the McLaren tailings is not part of current reclamation plans. Likewise, no reclamation is proposed for mine disturbances in Woody or Republic creeks, so water quality in those streams would not change. Nor would water quality change in the Broadwater River or Sheep Creek.

With reclamation, sediment levels would drop in streams currently affecte[illegible]y unnaturally high sediment discharges. For streams that either currently support or that could support a fishery, habitat quality for adult and juvenile fish would improve as sediment is flushed and channels adjust to lower sediment discharges. Pool depth and residual pool volume would increase. These habitat improvements would be most consequential in lower Fisher Creek and the upper Clarks Fork River where high sediment levels have decreased habitat quality. Fish reproductive success would also improve as sediment is flushed from spawning gravels.

Spawning habitat improvements could be realized in upstream and downstream reaches of the Clarks Fork and Stillwater rivers. Likewise, habitat quality for aquatic insects would improve. Aquatic insect diversity and abundance would increase in streams where sediment deposition or poor water quality is currently repressing insect populations, especially the upper Stillwater River, Fisher Creek, and the upper Clarks Fork River. Aquatic insect communities in Woody and Republic Creeks would be less likely to change because those streams have naturally high sediment levels. Only minor, if any, changes in habitat quality are expected for Soda Butte Creek below the Woody Creek confluence because of the naturally occurring high sediment loads from the Woody and Republic creek watersheds.

Eliminating the potential for future mine development eliminates risks associated with potential mine facility failures (*i.e.*, tailings impoundment failures) and potential ground-water contamination. This, in turn, eliminates risks for adverse effects to aquatic life which could offset any cumulative improvements resulting from planned reclamation. Assuming the FMEA developed for the NMW-PDEIS alternatives encompasses the risks that would be associated with other mine development, the likelihood of failure occurrence and severity of consequences to water quality and aquatic life would vary depending upon project design and facility location. As such, risks could range from very low failure likelihood with low consequences, to low likelihood with extreme consequences.

Effects to Yellowstone National Park

If federal lands within the proposed withdrawal area are closed to future mineral entry, and if the NWM Agreement is implemented, then there would be no potential for adverse effects to aquatic life in Soda Butte Creek within Yellowstone NP due to new mine development. Risks associated with ground or surface water contamination would be eliminated. The existing conditions of aquatic habitat and biota would remain, unless reclamation of point and non-point sources of metal pollution occurred within the Miller or Woody and Republic Creek watersheds, or the McLaren tailings.

If a new mine (or mines) were developed under the No Agreement Scenario, then potential effects to Yellowstone NP aquatic resources are similar to those described for Scenario A-1.

Cumulative Effects Common to All Scenarios: Past, present and reasonably foreseeable future actions (*i.e.*, highway reconstruction, future residential development), when considered collectively, significantly affect aquatic resources. Historical watershed disturbances, including roads, and other mining related activities, have increased sediment discharge and have reduced water quality in many study area streams. Fisher Creek, the upper Clarks Fork River, Daisy Creek, the upper Stillwater River, Woody Creek, and upper Soda Butte Creek have been most heavily impacted. These disturbances have adversely affected the health of aquatic communities. In addition, commercial and residential drainfields along Soda Butte Creek have increased nutrient levels in the stream. Acid drainage from the McLaren tailings would continue to exert the primary factor limiting aquatic insects and fish in Soda Butte Creek immediately below the tailings. Recent mine reclamation efforts, including recontouring and revegetating roads and open pit mines, and rerouting water from the Glengarry adit have improved aquatic health in Fisher Creek and the Upper Stillwater River, but to an unknown degree. Future reclamation efforts will continue to improve the overall health of streams within the study area. Future highway reconstruction could induce temporary sediment increases, and future residential development along Soda Butte Creek could further increase nutrient levels in the stream.

Conclusion

If the physical and biological data are considered as a whole, it is possible to make broad conclusions on the condition of the streams in the study area. Fisher Creek is in poor condition (Map 3-3) as a result of poor water quality and high sediment. The Clarks Fork River is in only fair condition in the study area. This is a result of metals from Fisher Creek and poor habitat quality in the form of sedimentation and limited pool and spawning sites. The Broadwater River is in good to excellent condition.

Miller Creek is naturally void of fish, and the invertebrate community indicates a relatively healthy stream. For Soda Butte Creek, conditions for fish and aquatic life are fair upstream of the McLaren tailings and downstream from Woody Creek (Map 3-4). Limitations include high gradients and low flows for the upper reach, and limited habitat and high sediment loads downstream from Woody Creek. Poor conditions are present in the section adjacent to and downstream from the McLaren tailings. Poor conditions are present in Woody and Republic creeks, primarily due to extremely high sediment loads and unstable habitat conditions. Historical mining may be influencing water quality in those streams. Sheep Creek is in good overall condition, and naturally void of fish.

Daisy Creek and the Stillwater River from the Daisy Creek confluence to Goose Creek are in poor health, due to poor water quality and high sediment loads. Upstream of Daisy Creek and below Goose Creek the stream is in fair condition. The Stillwater drainage above the wilderness boundary is naturally void of fish.

For Scenarios A-1 and B-1, the potential for at least one, and possibly three new mines to be developed in the study area remains unchanged. The effects of mining on fish and other aquatic life can generally be grouped into three main areas of concern: 1) reduced streamflow, 2) increased sediment delivery to streams, and 3) changes in water quality. These three factors may produce adverse effects alone, in combination, or synergistically. The magnitude, longevity, and direction of change is dependent in part on the existing condition of aquatic habitat and biota. For example, some streams in the study area (e.g., upper Fisher Creek, Daisy Creek) have been severely impaired by historical mining. For those streams, reducing streamflow, increasing sediment, and reducing water quality would have minimal effect on aquatic habitat and biota in terms of the relative magnitude and direction of change. They are already severely impaired and the downward trend commensurate with more degradation would be subtle. For streams with comparatively healthy aquatic communities (e.g., Miller Creek, the Broadwater and Clarks Fork rivers, and Soda Butte Creek), degradation could be more significant. Conversely, with improved water quality via active treatment or reclamation, the direction and magnitude of change for impaired streams could be positive and profound.

With any mine, but especially underground metalliferous mines with high acid generating potential, there are risks and uncertainties associated with unforeseeable and/or uncontrollable ground or surface water contamination and facility failures. Sound facility design, location and mitigation can substantially reduce, but not eliminate these risks. For healthy stream environments, especially those with high recreational value (i.e., Wild and Scenic designated reaches of the Clarks Fork River and Soda Butte Creek through Yellowstone National Park), the element of risk acceptability is of higher concern. Maintaining the current minerals management allows for the potential of mine development and therefore the potential for ground or surface water contamination. This in turn, increases the risk of adversely affecting the health of aquatic systems in the study area, compared to the alternative of prohibiting the potential for minerals exploration and development.

For Scenarios A-2 and B-2, there is potential to reduce or eliminate mining development in the study area if the NWM Agreement is implemented, thereby reducing or eliminating the potential for adverse effects to aquatic habitat and biota related to mine development. With planned reclamation and remediation, the health of Fisher Creek, the upper Clarks Fork River, Daisy Creek, and the upper Stillwater River would be significantly improved. There would be no risks associated with unpredictable groundwater contamination.

If the NWM Agreement is not implemented, there is still potential for one underground mine, in addition to the New World mine, and one open pit mine to be developed under existing valid claims. Reduced streamflow, and increased sediment would adversely affect aquatic habitat and biota. Water quality would likely improve over existing conditions because of discharge permit limitations and State Water Quality Laws. These improvements would have beneficial effects to fish and other aquatic life. Existing poor water quality is the primary factor limiting aquatic biota in most area streams. However, the potential risks associated with ground and surface water contamination due to unforeseeable or uncontrollable events, would remain.

RECREATION, SCENIC, AND SPECIAL AREAS INCLUDING YELLOWSTONE NATIONAL PARK

Substantive Changes between the Draft EIS and Final EIS

In Table 3-5, snowmobiling and cross-country skiing were added to the list of primary recreational activities occurring in Yellowstone National Park. Cultural resources were added as a study area attraction.

In the Affected Environment section, under the subheading of "Backpacking and Backcountry Use," a statement was added indicating the total miles of National Forest system trails within the study area.

In the Affected Environment section, under the subheading of "Driving for Pleasure," a statement was added to indicate that the Fisher Creek portion of the Daisy Pass/Lulu Pass loop road is generally not suitable for conventional passenger vehicles.

In the Affected Environment section, a new section was added to describe Travel Management in the area.

In the Affected Environment section, under the sub-heading "Semi-primitive Wildland Settings," clarified that semi-primitive wildland recreation settings in the study area are open to certain motorized use.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Local Population Effects on Recreation," information was added from the NWM PDEIS as an example of how non-residency rules for project-related workers can alleviate potential effects to recreation use.

A section on Cumulative Effects Common To All Alternatives was added.

Introduction

This section addresses the issues listed and described in Table 3-3. The introduction also includes a description of the importance of recreation and tourism in this area, and a summary of recreation trends.

Importance of Recreation and Tourism in the Greater Yellowstone Area

The quality of outdoor recreation experiences currently offered in the Greater Yellowstone area is extremely high. This can be attributed to the synergy of the spectacular scenery, abundant wildlife, and unique geologic features, all within a vast area, much of which is still relatively undisturbed by human development activities.

Maintenance of recreational resources in the area is important for both economic and quality of life reasons. The region's growth is being driven primarily through growth in spending on recreation and tourism products and services. If recreational resources were to become degraded or made more difficult to access, the health of the economy might be threatened.

Indirect effects of change in the area's character are at two levels. From a national and international perspective, change in the area's amenity resources could reduce its recognized value as a relatively natural or preserved ecosystem and as an important region for high quality outdoor recreation. At the local level, the vast majority of the 300,000 residents living in and around the area are linked to these natural amenities through economic, recreational, lifestyle, and social means.

TABLE 3-3. ISSUES RELATING TO RECREATION, SCENIC VALUES, AND SPECIAL AREAS INCLUDING YELLOWSTONE NATIONAL PARK

ISSUE	MEASUREMENT INDICATOR	UNIT of MEASURE
Effect on recreation opportunity and experience	Changes in recreation settings, visitation, and experiences.	Recreation opportunity settings, visitation
Scenic integrity	Alterations to landscape, compliance with visual objectives	Acres disturbed, qualita[illegible]
Effect on Yellowstone National Park	Recreation experiences, visitation, changes to Park operations, air and water quality.	Qualitative, noise, traffic, recreation experiences, visitation.
Effect on designated wilderness	Effect on wilderness attributes-solitude, natural integrity, primitive recreation, and apparent naturalness	Qualitative, noise, lighting, increase in visitation, water quality.
Effect on roadless areas	Effect on roadless area suitability and attributes	Qualitative, solitude, manageability and boundaries, natural integrity, primitive recreation opportunities.
Effect on wild and scenic river suitability	Characteristics of wild and scenic rivers, outstandingly remarkable values	Qualitative, water quality, scenery, free-flowing, recreation.
Effect on air quality	Emissions and particulates	

Some persons value this recreational/tourism economy when contrasted with an economy based on more traditional basic economic sectors such as manufacturing or mining, which are perceived by some to be in conflict with the quality of life in the area. Furthermore, since many residents of the area are users of the local and regional recreational resources themselves, degradation of, or reduced access to these resources would adversely affect some local residents' quality of life.

A Wilderness Society report (1992) stresses the importance of recreation, tourism, and non-labor income in the area's economy. The report presents an analysis of economic data and concludes that the health of the economy in the region is directly connected to the health of the ecosystem. The economy within the region is supported by:

- world-class quality of recreational resources;
- scenic amenities provided by Yellowstone NP and the surrounding National Forests and wildernesses; and
- overall high quality of life that attracts both tourists and new residents.

The overall quality of life, rather than strictly economic reasons, attracts people to the area. The Wilderness Society analysis is supported by Corkran (1993), who conducted two separate surveys of Cooke City/Silver Gate residents and business owners. Survey responses showed that the economic base of the current community and economy is the quality of the natural and social environment. The residents and entrepreneurs have assembled a modest, but sufficiently rewarding, economy and community.

Because of the current use patterns and potential for increasing demand for high quality recreational resources, continued access to and protection of regional and local resources (near the study area) are important goals of many persons and governmental agencies. However, the persistent growth in national and regional populations would continue to cause degradation of the recreation experience. Examples include localized overcrowding and heavy tourist traffic in summer, air and noise pollution from snowmobiles in winter, and impacts to scenery viewing from increasing residential development on private land in valleys throughout the area. Evidence of the concern is illustrated by the numerous studies and planning efforts which are underway or recently initiated to begin addressing these problems. A few examples include: a recently completed transportation study in Yellowstone NP; a cooperative National Park-National Forest winter use plan; Yellowstone NP's Backcountry Management Plan; and ongoing "Limits-of-Acceptable-Change" (LAC) analysis in National Forest wildernesses.

RECREATION

Based on recent trends, the demand for the type of recreation offered by this area is anticipated to grow. Evidence of this trend is provided by the 1994-95 National Survey on Recreation and the Environment, the latest in a series of National Recreation Surveys conducted by the federal government (USDA Forest Service, 1994-95). Approximately 17,000 individuals were surveyed. The percent change of persons participating in outdoor recreation by activity, comparing 1982-83 survey data with 1994-95 survey estimates, is displayed in Table 3-4.

For the Bozeman/Gallatin National Forest area, studies completed by A and A Research (NWP PDEIS, Recreation Technical Rpt., 1996) indicate that more regional residents in general participate in all types of outdoor recreation and in a wider variety of outdoor recreation than the national norm. Highest uses still fall in the driving for pleasure category and in trail related recreation activities. A much higher percentage of regional users engage in winter sports, hunting, and backcountry types of recreation than the national norm.

TABLE 3-4. OUTDOOR RECREATION PARTICIPATION TRENDS

ACTIVITY	% CHANGE (1982 - 1995)
Birdwatching	+ 155%
Hiking	+ 93%
Backpacking	+ 73%
Camping-primitive	+ 58%
Off-road Driving	+ 44%
Sightseeing	+ 39%
Snowmobiling	+ 34%
Camping-developed	+ 38%
Cross Country Skiing	+ 23%
Picnicking	+ 16%
Fishing	- 4%
Hunting	- 12%

Affected Environment

Recreation Activities in Study Area

Wildland recreation activities in the study area are diverse and occur year-round. Table 3-5 summarizes key attractions and recreation opportunities. Refer to Map 3-5 for the location of key recreation features within the study area. The NWP PDEIS Recreational Technical Report is the primary source for information about recreation uses within the study area.

Backpacking and Backcountry Use. Approximately 12 miles of trail are maintained by the Forest Service within the study area. Four trails receive the bulk of the recreational use. These are the Clarks Fork trail (USFS #567), the Lady of the Lake trail (USFS trail #31), Goose Lake Road and trail (USFS Rd. 3230 and trail #25), and the Lake Abundance Road and trail (USFS Rd. #212 and trail #84). The Clarks Fork trailhead received approximately 7,000 recreation visits in 1995. The Lady of the Lake trail is the second most heavily used trail in the study area. The Goose Lake 4 wheel drive trail ranked third, and the Lake Abundance 4 wheel drive and foot trail ranked fourth for amount of use received. Access to both the Lady of the Lake trailhead and the Goose Lake 4 wheel drive trail is by the Lulu Pass Road. The Daisy Pass Road is used to access Lake Abundance, and U.S. 212 provides access to the Clarks Fork trailheads. Peak use of area trails occurs during July and August.

Driving for Pleasure. The Beartooth Scenic Byway (US 212) traverses the study area linking the Red Lodge and Cody areas with Yellowstone NP. The most popular gravel road in the study area is the Daisy Pass Road/Lulu Pass Road loop. The Fisher Creek portion of this loop crosses several streams and is generally not suitable for conventional passenger vehicles. Popular 4 wheel drive trails include the Goose Lake and the Lake Abundance roads. Main season of use for this activity is July through mid-September. The Daisy Pass Road provides the main access to Daisy Pass, Wolverine trail, and the Lake Abundance road. The Lulu Pass Road provides access to the Lady of the Lake trailhead and the Goose Lake road.

Travel Management. Motorized vehicle access in and around the study area is managed by the Gallatin National Forest. Restrictions on motorized use are displayed on the 1996 Gallatin National Forest Visitors Map.

National Forest lands north of US 212 are closed year-round to off-road motor vehicle use (excluding snowmobiles) to provide for wildlife habitat security. Motorized vehicles are restricted to designated routes including the Kersey Lake, Goose Lake, Lake Abundance, and Lulu/Daisy Pass roads. Trails such as Lady of the Lake, Wolverine Pass, Clarks Fork and Upper Stillwater are closed to motorized use. There are no restrictions on snowmobile use within the study area.

There are no area closures or other travel plan restrictions for National Forest lands south of US 212 within the study area.

Fishing. There are three general locations within and adjacent to the study area where most of the fishing activity occurs. These include the lakes and streams in the Clarks Fork trail area (Kersey, Fox, and Rock Island lakes), the "upper" lakes area accessed by the Lady of the Lake and Goose Lake Roads (Goose Lake, Lady of the Lake, Round Lake, and Aero Lakes), and the Lake Abundance and the lower Stillwater River areas, which are accessed by the Lake Abundance 4 wheel drive trail. The main season of use is late June to mid-September, depending on ice and snow conditions. The average annual number of angler days for the three fishing areas are: Clarks Fork (3,318), Goose Lake/Round Lake area (514) and Lake Abundance area (434) (NWP PDEIS, Recreation Technical Report).

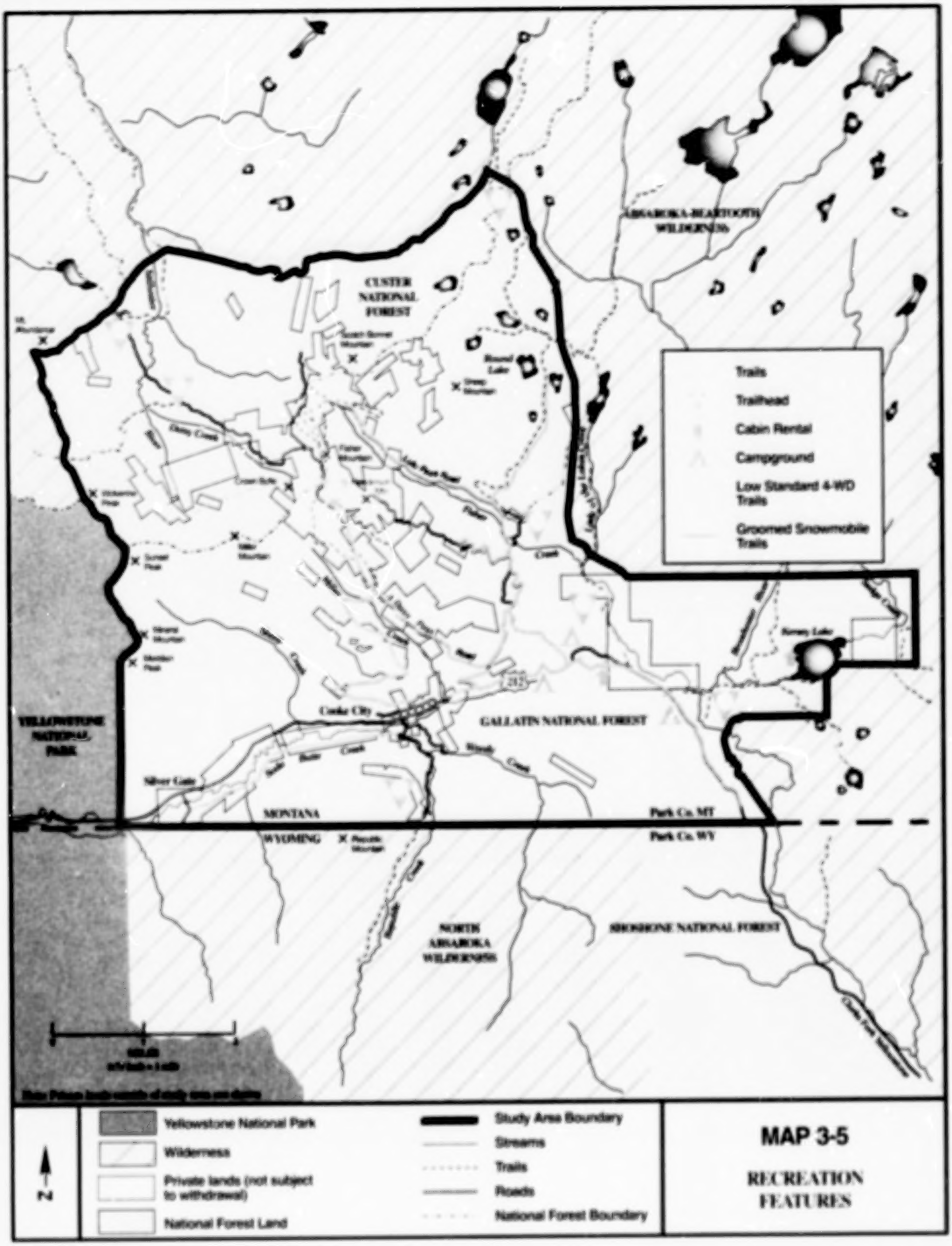
Mountain Biking. The season of use for mountain biking generally occurs from late-June to mid-October or until trails become impassable due to snow. Peak use is mid-August. The most popular trails in the project area include the Daisy-Lulu loop and the western segment of the Bannock trail. Others include Goose Lake and Lake Abundance 4 wheel drive trails.

Hunting. Hunting for a variety of big game occurs in the study area. Lands surrounding the Daisy-Lulu loop receive heavy hunting pressure, especially around Daisy Pass where, on opening day, 50 to 100 vehicles and horse trailers are parked along the road. Daisy Pass serves as a starting point for outfitters and others using the Wolverine and Lake Abundance trails to access hunting areas and camps in the Slough Creek and Stillwater River drainages. The Lake Abundance and Goose Lake roads as well as the Clarks Fork trail also receive use by hunters. The Cooke City area is located in one of Montana's few early elk hunting districts. The early season begins September 15 and lasts until the regular season starts at the end of October. The regular elk season lasts until December 1.

Snowmobiling. During the long winter season (mid-November to mid-April), snowmobiling is the primary recreational activity in the study area. Peak periods of use are the Christmas holiday season, February, and March. There are over 21 miles of groomed snowmobile trails in the Cooke City area. Counter data provided by Montana Department of Fish, Wildlife and Parks showed about 37,000 sleds

TABLE 3-5. KEY ATTRACTIONS AND RECREATIONAL OPPORTUNITIES

RECREATION RESOURCE	PRIMARY ACTIVITIES/COMMENTS
Absaroka-Beartooth Wilderness Gallatin, Shoshone and Custer National Forests	Surrounds study area on west, north and east boundaries. Seven major wilderness trailheads within study area including Lake Abundance, Wolverine Creek, Stillwater River, Goose Lake, Kersey Lake area, and Lady of the Lake. Hiking, camping, fishing and hunting.
North Absaroka Wilderness Shoshone National Forest	Borders study area to the south. Republic Pass trail accesses wilderness from study area. Covers approximately 350,488 acres at the northern end of the Shoshone National Forest. Hiking, horseback riding, camping and hunting are popular activities.
Study Area Gallatin National Forest Custer National Forest	22,000 acres of land within study area is popular for hunting, hiking, fishing, scenic driving, horseback riding, camping, snowmobiling, cross-country skiing and four-wheeling. In the study area, popular trails include the Clarks Fork, Lady of the Lake, Goose Lake, and Lake Abundance trails. The Daisy Pass/Lulu Pass loop road is popular for pleasure driving. Three campgrounds in study area (Soda Butte, Colter, Chief Joseph) have about 9,000 visitors annually. The New World Historic District provides cultural resource attractions.
Roadless Areas within Study Area Gallatin National Forest, Custer National Forest	Four roadless areas within study area including Beartooth, Republic, Reef and North Absaroka. Nearly 12,000 acres of the study area (60%) are inventoried as roadless. Roadless areas provide opportunities for hiking, mountain biking, cross country skiing, snowmobiling, hunting and fishing.
Designated and Eligible Wild and Scenic River segments. Shoshone, Gallatin and Custer National Forests, Yellowstone NP	20.5 miles of the Clarks Fork Yellowstone River on the Shoshone NF are designated as a wild river. 1.5 miles of this river on the Gallatin NF is an eligible river. Access to the wild reach is difficult but limited floating and fishing occur. Soda Butte Creek within Yellowstone NP and the Stillwater River within and downstream from the study area are eligible river segments.
Beartooth Scenic Byway (U.S. 212) (managed in cooperation with State of Wyoming and National Park Service).	Approximately 8 miles of Scenic Byway traverses the southern portion of study area. Primary access route to Yellowstone NP and Beartooth Plateau. Sightseeing, access to recreation (i.e. campgrounds, trails, fishing, hunting, etc.)
Chief Joseph Scenic Highway (WY 296).	Primary access from Cody area to Yellowstone NP and Beartooth Plateau. Sightseeing, access to ranches and other residences along route, and to recreation areas (campgrounds, trails, wilderness).
Yellowstone National Park	Sightseeing, camping, picnicking, hiking, fishing, wildlife-viewing, snowmobiling and cross-country skiing. About 3 million persons visit the Park annually. The number of visitors entering the Park through the northeast entrance is increasing.
Privately Managed Resources	
Dude Ranches	Guest accommodations, horseback riding, pack trips, hiking, fishing, hunting. There are several dude ranches along US 212.
Outfitting	Several outfitters operate in the vicinity of the study area. Dude ranches along the transportation corridor also provide guide service.



MAP 3-5

RECREATION FEATURES

inventoried for the 1995-96 season. Some of the most heavily used trails include U.S. 212, Daisy Pass, Lulu Pass, and the Goose Lake roads. Important off-trail areas include the Upper Stillwater River area, open terrain to the north of Scotch Bonnet and Sheep mountains, and the open areas along Miller and Fisher creeks.

Cross-country Skiing. The general season of use for cross-country skiing is basically the same as the snowmobiling season (from mid-November to mid-April). Peak use periods are Christmas holidays and weekend periods to early April. Spring skiing can last into June, especially in the Beartooth Plateau region. The Republic Pass trail south of Cooke City is one of the most used trails for cross-country skiing. Woody Creek trail, particularly along Woody Ridge, is also a popular ski route. Sheep Creek basin, north of U.S. 212, receives heavy use. There are no groomed snowmobile trails into this area, and skiers ski along Sheep Creek and in the bowl, which is flanked by Miller and Mineral mountains. Cross-country skiing also occurs on the south and east slopes of Henderson Mountain, the northeast slopes of Fisher Mountain, and on the southwest slopes of Scotch Bonnet Mountain.

Campgrounds and Picnic Areas. The Gallatin National Forest manages three campgrounds within the study area: Soda Butte, Colter, and Chief Joseph. The district also maintains the Clarks Fork picnic area and a rental cabin at Kersey Lake. Total use is about 10,500 visitors per year.

Guides and Outfitters. Outfitters must obtain permits from the local Ranger District to operate on National Forest lands. Permits are issued for both day use and overnight camping. Permitted outfitter and guide use for the area has been as follows: overnight use in Cooke City and Beartooth plateau–1,200 service days, Slough Creek–1,326 service days, and day use in Cooke/Crandall/Sunlight/ Beartooth Plateau–5,850 service days. Season of use is generally July and August for the summer season and mid-September to mid-October for the hunting season. Outfitters will usually use the same trailheads that are popular with other users (Clarks Fork, Lady of the Lake, Goose Lake, Lake Abundance, and Wolverine trails), but often leave the main trail and go cross-country to provide their guests with a more primitive experience and to increase their hunting opportunities. There are other outfitters who do not have camps in the Cooke City area, but may pass through the area en route to their camps. Most of these outfitters drive up the Daisy Pass Road and park their vehicles at Daisy Pass. From there, they use the trails heading west (Wolverine and Lake Abundance) to access their camps on Slough Creek and other drainages further west.

Recreation Opportunity Settings

An inventory of an area's wildland recreational settings based on the physical, social and managerial attributes of the area is the basis for the Recreation Opportunity Spectrum (ROS). Based on combinations of these attributes, all National Forest lands are characterized by recreation opportunity classes. These classes range from primitive, represented by wilderness areas, to rural, represented by highways, developments, and towns. The opportunity classes serve as an inventory tool for current recreation conditions and visitor expectations. As potential mineral development could lead to changes in these settings, they serve as a useful measure to help describe the consequences of such change. (ROS Primer leaflet R-6-021-90, April 1990). The current recreation opportunity settings in the study area are outlined on Map 3-7.

Designated Wilderness. Designated wilderness areas, such as the Absaroka-Beartooth and the North Absaroka, are examples of the primitive wildland recreation opportunity spectrum, where the physical settings are large areas of land, remote from human developments, with little or no evidence of any human activities. These settings offer substantially more opportunity for solitude, risk, and discovery. Socially, encounters with others is low and then only with people engaged in similar activities. Those who engage in these activities have a high probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance; the environment offers challenge and risk. Presence of land management control is low.

Semi-primitive Wildland Settings. Semi-primitive wildland settings are common in the study area. Republic/ Woody Creek, Sheep Creek, Upper Stillwater, Round Lake and Kersey Lake are considered semi-primitive settings. Semi-primitive settings are typically undeveloped and accessed by trail or low standard four-wheel drive roads. Along or near the forest trails, a recreationist would find landscapes of distinctive scenic quality. The landscape appears unaltered and intact. The only noticeable deviations may be some past mining activities. Leaving better roads behind, the recreationist finds increasing isolation from the sights and sounds of human activity. The degree of risk and isolation increases and recreation activities become increasingly dependent upon natural surroundings. Hiking, mountain biking, and horseback riding occur on trails while motorized use is generally limited to low standard roads. Because portions of these areas are accessed by motorized routes, and all of the settings are open to snowmobiling, the areas are considered semi-primitive, motorized settings. There are no semi-primitive non-motorized settings in the study area.

Roaded Natural-Appearing Wildland Setting. The roaded natural-appearing wildland setting includes the Lulu Pass/ Daisy Pass loop road area. Subtle modifications to the landscape may be present including timber harvest and signs of historic mining activity, but the natural appearing landscape still dominates the scene. There is usually less opportunity for solitude due to access provided by roads. Along the roads, a recreationist will find landscapes of distinctive scenic quality with sightings of Miller Creek, Miller Mountain, Bull of the Woods Pass, Crown Butte, Fisher and Henderson Mountains. Recreation improvements are limited to roads and trails.

Rural Class. The rural class is represented by the corridor along US Highway 212 including Cooke City and Silver Gate. Rural settings include concentrated human developments with higher levels of human activity.

A sequential progression of settings from the more developed areas along the highway to the more pristine and primitive wildland recreation settings of the wilderness occurs within the study area.

Environmental Effects

Introduction

Assessment of effects to recreational resources and opportunities is difficult because of the subjective nature of the recreation experience, the complex factors contributing to recreational use and the determination of "acceptable" levels of use. People are attracted to an area because of the recreation setting and opportunities present. In general, if the setting, attractions, and character of the area change, there is a strong likelihood the recreational use of the area will change. Sources of potential effects include changes in settings due to mining facilities, potential loss of solitude due to mining-related noise, lighting and traffic, and increase in local recreation use due to increases in local populations.

Effects to recreation resources cannot be viewed or analyzed in isolation. Rather, the effects are highly interdisciplinary in nature. Recreational resources have relationships with many other elements of the human and natural environments. The best professional judgment of the lead agencies as to the potential effects upon recreation resources is presented in the following discussion.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

With no mineral withdrawal, roadless areas and the area immediately adjacent to Yellowstone NP remain open to mineral entry. Development within these areas would change recreation settings and would have an adverse effect on recreation occurring in the vicinity of future mines. Some recreational users of the immediate mine area would be displaced and would use other areas either within or outside the study area. Future mining would not likely decrease overall visitation to National Forests or National Parks in the surrounding area.

The construction, operation or presence of mining-related facilities would affect wildland recreation settings, experiences and visitor use. Mining would:

- remove recreational resources, or modify recreation settings, or change access to a recreation area;
- change recreation experiences due to project-related activities (e.g., mine truck traffic) or presence of a project-related facilities;
- reduce the feelings of solitude and remoteness due to introduction of visual, sound (e.g., noise) or other sensory effects from project-related activities which would conflict with recreational use;
- and potentially affect the health of the regional ecosystem (e.g., including plants, trees, wildlife, and fish), thereby degrading the opportunity to use these resources for recreation.

Some of these direct effects would be lessened or removed when mining and reclamation is completed. Even after reclamation, some recreational resources near project sites would never return to pre-project quality because of the long-term existence of the tailings disposal area(s) and other mining-related changes to the existing environment.

Conflict with Mining Activities and Facilities. Direct effects to wildland recreational resources and opportunities would result from mining related activities including project construction, operation, and the location of facilities. Some of these effects are sensory in nature (an effect from sight, sound, smell, etc.). Other effects would result from direct conflict with project operational elements in such a way that the existence of or access to an existing recreational resource would be adversely affected or lost by the general public.

Future mining would directly affect recreational use of the lands to be used for project facilities and use of the highways and roads that provide access to the area. For example, if a mine the scale of the New World Project is developed, access roads such as the Lulu Pass Road would be substantially upgraded to serve as the main access route to the mine area. This road is currently part of a network of snowmobile trails, and is generally regarded as an outstanding snowmobiling experience by both local residents and visitors. As this road or the Daisy Pass road could become mine access roads, part of these roads would become unavailable to snowmobilers to avoid conflict with mining facilities and safety concerns. Even though alternate snowmobile routes could be developed, the experience would change.

Currently, US 212 from the junction with Wyoming 296 to Cooke City is not plowed and is a popular snowmobile route during the winter season. If a large scale mine is developed, US 212 would be plowed to provide for year-round access, displacing current snowmobile use. While this snowmobile trail could be rerouted to provide access to Cooke City, it is unlikely that the snowmobiling experience would be similar in quality to current conditions. With these two changes to the local snowmobile recreational resource base, some portion of this recognized recreational user group would be adversely affected, resulting in either a degraded recreational experience and/or in changes in local or regional snowmobiling use patterns.

The Lulu Pass Road and Daisy Pass Road also provide the major access routes from Cooke City to the Absaroka-Beartooth Wilderness. During the summer, there is camping in undeveloped campsites along these roads, especially by off-road vehicle recreationalists and mountain bikers who ride the network of two-track roads in the vicinity. Future mining development would displace such use due to traffic associated with mining. Conflicts between hunters and mining activities could occur if hunting access in the vicinity of any mine is disrupted. For example, if the New World Project were developed, mine use of the Lulu Pass Road would affect use of the Goose Lake Road, popular for hiking, snowmobiling, skiing, and hunting access.

Change to Recreation Settings. Depending on the location of future exploration and mining, recreation opportunity settings may change. For example, if development occurs in areas classified as semi-primitive (Republic/Woody Creek, Sheep Creek, Upper Stillwater, Round Lake and Kersey Lake) the attributes of that setting may change to roaded natural. Under some circumstances, the altered setting may no longer fit into the ROS system because recreation is no longer provided on that site. When recreation settings change, the type of recreation is likely to change as well.

In the study area, direct visibility of mining development activities would eliminate feelings of remoteness and isolation. With sights and sounds of mining, milling, road traffic and a workers camp nearby, feelings of remoteness and isolation are reduced. New facilities would be built solely to support mining purposes and processes. People would be more regulated and controlled near mining activity areas. They may not be allowed access to or near mine areas and supporting roads and facilities. Traffic on roads may become blocked, interrupted or congested. Roads may be built specifically for mine purposes when safety is a high priority. Roads for mining equipment are typically wider than forest roads and may have bermed shoulders for safety. Traffic management may be employed to reduce volume and conflicts in use.

Sensory Effects on Recreational Experiences. Sensory experiences are a substantial determinant of the quality of a recreational experience. This would be especially true for wilderness/backcountry users who are seeking a natural experience without intrusions caused by the presence of man. Examples of sensory effects on the quality of recreational resources include additional noise compared to background (natural) levels, a perception of congestion and crowdedness of the area resulting from mining-related traffic, or artificial night lighting.

The impact of noise and artificial light depends on the location of future mine facilities. The New World Project serves as an example of the types of effects for this area. The noise impact analysis conducted for the NWP PDEIS, (Noise and Electric Field and Magnetic Fields Technical Report), indicates that various levels of noise would be audible in the area surrounding the mine project area and environs during all phases of mine operations. Noise levels of 55 dB(A) or higher would occur in close proximity of project activities. For reference, a noise level of 55 dB(A) is approximately equivalent to a human voice at normal speech levels.

Recreational users in the immediate project vicinity (e.g., snowmobilers, cross country skiers, hikers, bicyclists, etc. using the Daisy Pass Road or the Lulu Pass Road) would hear audible sounds from project construction and operations at the 40-55 dB(A) levels throughout the proposed project time frame. Noise levels would be even higher with closer proximity to the project site. The effect of this noise on recreational users would be dependent upon individual values, goals, and expectations. Most noise would be less than that produced by snowmobiles. Consequently, it is likely that snowmobilers would be least affected by the increased noise associated with mining. Those seeking to avoid noise would be most affected; it is possible that some users in this category would seek other areas for their recreational opportunities.

The noise analysis indicates that noise might also be heard within the Absaroka-Beartooth Wilderness east of the project site (northeast of Cooke City/Silver Gate). Project-related noise of up to 40 dB(A) during some project phases might be heard from the wilderness boundary, gradually decreasing to inaudible levels further into the wilderness. In some circumstances, project noise might be slightly audible at Lady of the Lake (a primary fishing opportunity) in the wilderness. Those seeking the wilderness attribute of solitude may be affected by this noise, and may have to travel further to avoid this noise. The ultimate effect, again, would depend on individual values, goals, and expectations.

Operation of a major mine requires artificial lighting during the night. In all mine alternatives, lighting would be designed to minimize off-site effects. Night lighting would be visible to recreationist camping or stargazing in the vicinity of the mine, diminishing the feelings of remoteness and solitude.

Local Population Effects on Recreation. As discussed in the Social section of the EIS, the increased population would be due to employees working on future mines, indirect workers, and family members associated with the inmigrating miners and service workers. For example, if a mine the scale of the New World Project was developed, the peak projected population increase associated with the project is 320 persons, while the operations phase increase is projected to be 200 persons.

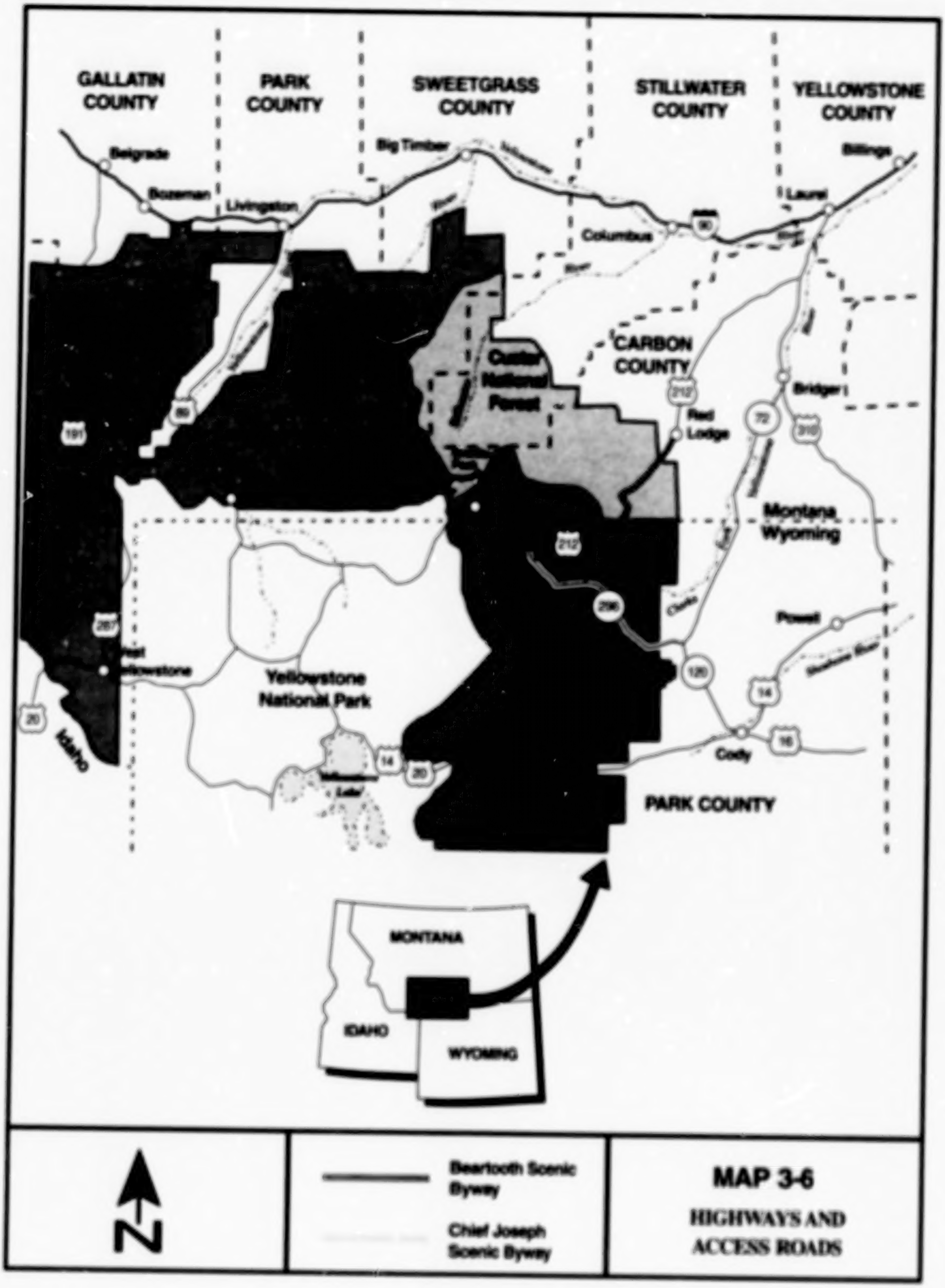
The permanent residency areas of mine workers would be spread among a variety of communities in the relatively large study area (Park County, Wyoming and Park County, Montana). Most of the mine workers would use an on-site workcamp during their work periods at the project site. Therefore, miners would have access to area recreational resources during off-hours while at their residences, off-hours while at the workcamp, and during their commutes to and from the project site. Service workers and family members also would have ready access to the area's recreational resources.

The presence of new construction and/or operations workers living and working in the region would lead to potential increases in hunting, fishing, snowmobiling, hiking, and other recreational activities. Mitigation measures such as non-residency rules (including camping sites) for project-related workers in the Cooke City/Silver Gate area and through the Sunlight Basin corridor, help reduce the potential for long-term camping and unsafe/illegal activities such as poaching, trash disposal, or other problems. The non-residency rule restricts most Crown Butte mine employees and contractors from establishing temporary or permanent residences in the Cooke City to Sunlight Basin Corridor. Furthermore, a clause would be included in Crown Butte's employment contract that would prohibit workers from camping on Forest Service lands other than those approved by the Forest Service. (NWM, PDEIS, Chapter 2, P. 30). Effectiveness of mitigation would be dependent on the availability of additional public lands personnel for monitoring and enforcement.

Area Highways. A change in the amount and type of traffic on area highways would occur with future mining. The magnitude of the change depends on the amount of mining and whether tailings are disposed of off-site. Access to the northeast entrance of Yellowstone NP is provided by U.S. 212 (Beartooth Scenic Byway) and WY 296 (Chief Joseph Scenic Highway) Map 3-6. Both roads may be used for access for future mining. The northeast entrance is the least used of the five entrances, accounting for between 5 and 7 percent of total Park visitation (~3 million) over the past five years. U.S. 212 over Beartooth Pass is closed about seven months of the year during the winter. The overall accident rate on U.S. 212 is comparable to other highways of the same type. The nine mile segment between Yellowstone NP and the Montana/Wyoming State line has a higher than average accident rate. This segment remains in much the same condition as when it was originally built in the 1930s. This segment is too narrow to accommodate existing and projected traffic safely, and the road surface is in poor condition. Sharp curves along portions of the road restrict visibility and create hazardous driving conditions. The Federal Highway Administration has proposed to reconstruct this section of U.S. 212. The proposed project is scheduled for several years of construction, beginning in fiscal year 2000, depending upon available funding.

Conflicts between large truck traffic and recreational traffic are likely on US 212 and Wyoming 296 and on other area roads such as Miller Creek or the Lulu Pass Road should future mines be developed. Increased traffic on area highways and mine-area roads would make recreational traveling and viewing less acceptable and more dangerous for some persons, depending on individual or group values, goals, and expectations. An increased use by trucks for hauling tailings off-site would be noticeable and considered by many recreationists to be incompatible with the highways' designations as scenic routes. Effects could be partially mitigated by requiring night-hauling on area highways, and by constructing additional vehicle turn-outs.

Effects from the Degradation of the Ecosystem and Its Individual Elements. From both a quality of life perspective and the importance of recreation/tourism in the existing economy, negative effects on the health of the ecosystem



MAP 3-6

HIGHWAYS AND ACCESS ROADS

would result in negative effects on the abundant recreation resource base. Potential effects to wildland recreational resources might result from mining-related effects on hydrology, aquatic habitat and related species abundance, terrestrial wildlife habitat and related species abundance, and vegetation. If the health of one or more of these natural elements of the ecosystem were degraded, the ability to hunt, fish, observe wildlife, sightsee, or engage in other recreational activities could also be affected.

Recreational resources such as hunting and fishing would be affected in some very localized areas where wildlife patterns or fishing opportunities might be altered due to mining. From a broader regional perspective, hunting, fishing and other recreational opportunities would remain basically the same as those within the existing environment. Overall, the vast majority of regional recreational opportunities would not be affected by the projected mines unless recreational users would be in close proximity to mining facilities or if individual values, goals or expectations were adversely affected by the presence of the facilities.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

The potential for mining-related effects to recreation are significantly reduced due to the NWM Agreement. The New World Project would not be developed and the area of highest mineral potential is no longer available for mining. The risk of effects to recreation experiences and recreation settings is significantly reduced. If a mine were developed on remaining private land or federal land, the effects would be similar to those described above for Scenario A-1.

Depending upon the location of future exploration and mining, existing recreation opportunity settings could change. For example, if development occurs in areas classified as semi-primitive (Republic/Woody Creek, Sheep Creek, Upper Stillwater, Round Lake and Kersey Lake) the attributes of that setting may change to roaded natural. Roadless areas and the area immediately adjacent to Yellowstone NP and wilderness areas remain open to mineral entry.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

The existing recreation setting of withdrawn lands (17,760 acres) would not change as a result of mining-related surface disturbance. The four designated roadless areas would be withdrawn from mineral entry, reducing the potential for future mining-related development that could affect roadless values. (Refer to Roadless Area section of this chapter for a more detailed discussion of this issue.) The withdrawal would also include lands immediately adjacent to Yellowstone NP and the two Wilderness areas.

Mineral development on private land and unpatented mining claims in the central portion of the study area would lead to effects similar to those described for Scenario A-1. Potential effects would include mining-related noise, artificial lighting, traffic, industrial facilities and increase in the local population. Displacement of existing users would be likely due to changes associated with mineral development.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

In general, the recreation settings and opportunities in and around the study area would not be affected by mining-related activity. Opportunities for solitude and primi-

and semi-primitive recreation would be maintained. The potential for mining-related effects to resources including water quality and wildlife is reduced which would help maintain existing recreation uses related to fishing and hunting. There would be no significant influx of workers and support staff associated with a major mine. There would be less potential for conflict with mining related traffic on area roads and highways. Relatively high quality recreational experiences would continue, although continued growth in recreation and tourism may affect recreation resources and experiences.

Cumulative Effects Common to All Alternatives

Recreation use is expected in increase under all scenarios. Increasing recreation use is not likely to alter recreation settings but it would likely affect recreation experiences. Opportunities for solitude could diminish with increasing use. Increasing recreation pressure may result in additional restrictions and may require increased investment in recreation-related infrastructure such as trails and roads.

Continued residential development of private land could affect recreation if such development expands beyond the highway corridor. Development of more remote private land could change the character of the area and result in posting of private lands. Additional roads could be constructed or existing roads on private land could be closed to the public. Water quality and wildlife could be affected by private land development.

Reclamation could improve visual quality by revegetating the McLaren and Como Pits. Improvements to water quality also benefits recreation use of the area.

Conclusion

Mineral development associated with Scenario A-1 has the greatest potential for change to recreation settings and experiences in and around the study area. Industrial activity tends to dominate local settings potentially eliminating the "wildland" character that now exists. The sense of isolation and remoteness would be lost in portions of the area. Future mining is not likely to decrease overall visitation to National Forests or National Parks in the surrounding area. Some users would be displaced due to conflict with noise, traffic, and general mining activity. Other users may be more tolerant or attracted to the area to view a mine in operation. Mining-related traffic, including ore trucks, may make recreational travelling and viewing less enjoyable and perhaps less safe, depending upon individual values and expectations.

Implementation of the NWM Agreement (Scenario A-2) significantly reduces the potential for changes to existing recreation settings and experiences. If a mine is developed on available federal land or private land outside the NWM Agreement area, effects similar to those described above could occur. Federal lands adjacent to wilderness and Yellowstone NP remain open to mineral entry.

The mineral withdrawal (Scenario B-1) would help maintain the existing recreation settings and opportunities. The withdrawal applies to largely undeveloped roadless areas adjacent to the surrounding wilderness. Mineral development is likely to occur in the central portion of the study area on private land and unpatented mining claims. This would affect recreation similar to Scenario A-1.

Since the probability of a major mine is greatly reduced due to the combined effects of the withdrawal and NWM Agreement (Scenario B-2), the potential for effects on existing recreation settings and opportunities from mining would be very low. Recreation use would continue to increase. There would be minimal risk of displacement of users to other areas, and minimal conflict with mining-related traffic or development.

Scenic Integrity

Substantive Changes between the Draft EIS and Final EIS

Under Viewer Sensitivity, a sentence has been added concerning the scenic values of adjacent wilderness and Yellowstone National Park.

Table 3-7 was expanded to add key observation points existing along U.S. Highway 212, the Beartooth Scenic Byway.

In the discussion of the effects of Alternative Scenario A-1, a section on the effects of an open pit mine was added.

A section on cumulative effects common to all alternatives was added.

Introduction

The study area is part of the Beartooth Plateau, renowned for its scenic beauty. The vegetation, landforms and geology result in a landscape that is very diverse and highly scenic. Rugged peaks rise above glaciated valleys with numerous wetlands and streams. The mosaic created by the vegetation and landforms is visually pleasing. Scoping comments often refer to the scenic quality of this area.

Scenic integrity directly supports wildland recreation experiences. Mining has altered scenic integrity in portions of the study area, however, for the most part, the area still retains high levels of scenic integrity.

Key elements of this assessment include:

- identifying the existing scenic integrity of the natural and cultural landscape of the study area;
- identifying Key Observation Points (KOP) and viewer sensitivity;
- describing potential alterations to scenic integrity that could result from mining;

Viewer Sensitivity

Viewer sensitivity is a measure of people's concern for scenic integrity and is often described in terms of viewer expectation, the number of viewers, the importance of the observation point or viewing area, and view duration. Scenic viewing is one of the most common recreation and leisure pursuits of visitors to the study area. Additionally, the majority of outdoor recreation in the study area includes some amount of scenic viewing as a secondary recreation benefit.

Public concern for scenic integrity in the study area is very high. Expectations for high quality, pristine scenery are tied to the visitor's notions about Yellowstone NP, the Chief Joseph Scenic Highway (WY 296), the Beartooth Scenic Byway (U.S. 212), the Absaroka-Beartooth Wilderness, and the North Absaroka Wilderness. The surrounding designated wilderness and Yellowstone National Park are managed to preserve very high scenic integrity levels. For visual resource management objectives for the study area, refer to Map 3-8, Visual Quality Objectives. Scenic viewing from automobiles, other forms of motorized and nonmotorized recreation, cabins and second homes, surrounding recreation sites, and key observation points and viewing areas heightens viewer expectation. During the summer recreation season, use is greater and visual sensitivity higher.

Study Area Analysis

The amount of any human disturbance and intervention serves as a measure of deviations from the natural landscape characteristics and determines an area's existing scenic integrity. (Landscape Aesthetics, A Handbook for Scenery Management, USDA Forest Service, December, 1995, pg 2-4). The degree of naturalness of the landscape and recreational settings may be changed as mining activities become more visually apparent and begin appearing as human-caused alterations to the natural landscape.

For this analysis, Scenic Integrity Levels (SIL) are the frame of reference used to inventory naturalness of the lands being viewed and any alterations to these lands. Scenic integrity levels are comparable to Visual Quality Objectives (VQO). VQO's are used in the Forest Plans to specify the visual attributes of proposed land management activities.

Description of Scenic Integrity Levels

In either SIL or VQO scales, harsh alterations to the landscape decrease the existing scenic integrity of a natural landscape, while subtle alterations do not. The degree of visual change depends on the location of future mining facilities. In general, visual effects are accentuated on steeper ground, when color or significant contrast is created due to changes in edges, and on higher locations such as ridges or peaks. (Table 3-6, Description of Scenic Integrity Levels.)

TABLE 3-6 DESCRIPTION OF SCENIC INTEGRITY LEVELS

Scenic Integrity Level	Degree of Landscape Alteration	Visual Quality Objective
Very High	Unaltered Landscape	Preservation
High	Appears Unaltered	Retention
Moderate	Slightly Altered	Partial Retention
Low	Moderately Altered	Modification
Very Low	Heavily Altered	Maximum Modification
Unacceptably Low	Extremely Altered	None

Key Observation Points

Twelve key observation points were identified (Table 3-7) for the study area. A key observation point (KOP) is a location from which key portions of the study area are visible. The KOPs were selected based on their proximity to the study area, their location in specially designated areas, such as Yellowstone NP or a designated wilderness, and/or their recreational use. The relative elevation and terrain between an observation point and mine features are the primary determinants of visibility.

TABLE 3-7: LOCATION AND USE OF KEY OBSERVATION POINTS

Key Observation Point	Location	Recreational Use	Type of Access	Level of Use
WILDERNESS LOCATIONS				
Lake Abundance	4 miles northwest of Daisy Pass in A-B Wilderness	Hiking, fishing	Pedestrian	Low-moderate
Pilot Peak	4 miles southeast of Cooke City in North Absaroka Wilderness	Climbing	Pedestrian	Very low
YELLOWSTONE NATIONAL PARK LOCATIONS				
Wolverine Peak	Northwest corner of YNP	Hiking	Pedestrian	Very low
Republic Pass	5 miles south of Cooke City on border of YNP	Hiking	Pedestrian	Low
LOCATIONS WITHIN STUDY AREA				
Daisy Pass	3 miles north of Cooke City, head of Miller Creek and Daisy Creek	Sightseeing; snowmobiling; mountain biking; hunting access	Motorized	Moderate
Lulu Pass	4 miles north of Cooke City, head of Fisher Creek	Sightseeing; snowmobiling; mountain biking; hunting access	Motorized	Moderate
Goose Lake Road	3 miles north of Cooke City near Fisher Creek	Sightseeing; hiking	4-wheel drive	Low-moderate
Lady-of-the-Lake Trailhead	3 miles northeast of Cooke City near Fisher Creek	Hiking	Pedestrian	Low-moderate
BEARTOOTH SCENIC BYWAY, U.S. HIGHWAY 212				
Near YNP	Near YNP entrance	Sightseeing	Motorized	Very high
Arbor Day Overlook	3 miles east of Cooke City on U.S. 212	Sightseeing	Pedestrian Motorized	High
Pilot Overlook	17 miles southeast of Cooke City on U.S. 212	Sightseeing	Pedestrian	High
Clay Butte Lookout	18 miles southeast of Cooke City on U.S. 212	Sightseeing	Motorized	High

Although only twelve KOPs were used to complete this analysis, the potential mining would be visible from numerous other locations around the study area. Although there are many observation points, twelve were chosen where both public access and visibility warranted their analysis.

Affected Environment

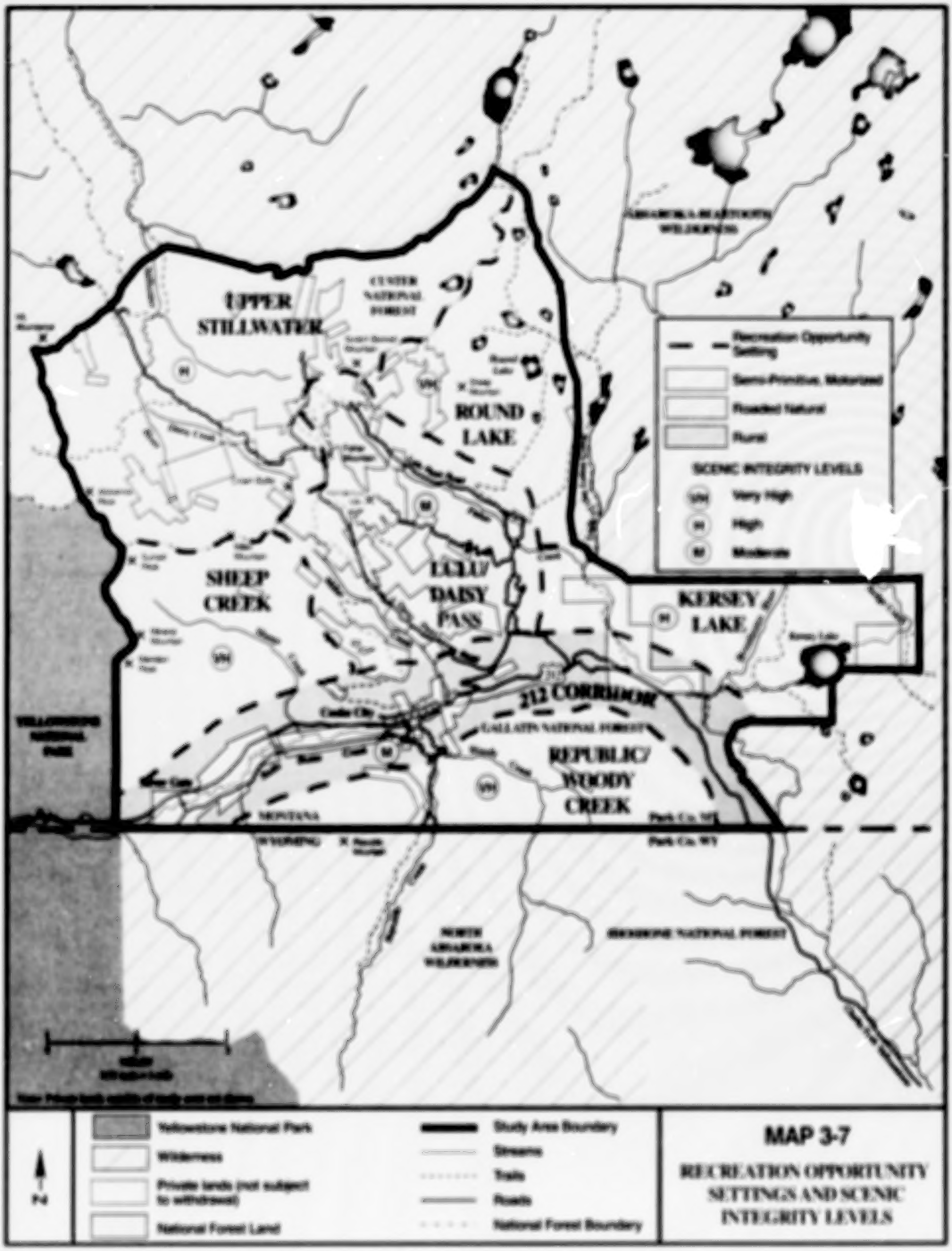
Existing Scenic Integrity and Visual Quality Objectives

Table 3-8 describes the existing scenic integrity for discrete landscape units of the study area. Map 3-7 displays the existing scenic integrity of the area. Map 3-8 displays the existing visual quality objectives for the study area.

Cultural influences have had an obvious effect on the mine area landscape for over a century. The most apparent changes have come from mining activities in the Miller, Fisher, and Daisy Creek drainages. The study area is checkered with old mine workings, tumbled down structures, waste rock areas and open pits, abandoned cabins, and roads which access these various locations. The old mine camps, structures, and cabins contribute to the "sense of place" and character surrounding the Cooke City area (see Chapter 3–*Cultural Resources* for additional information on the area's mine history).

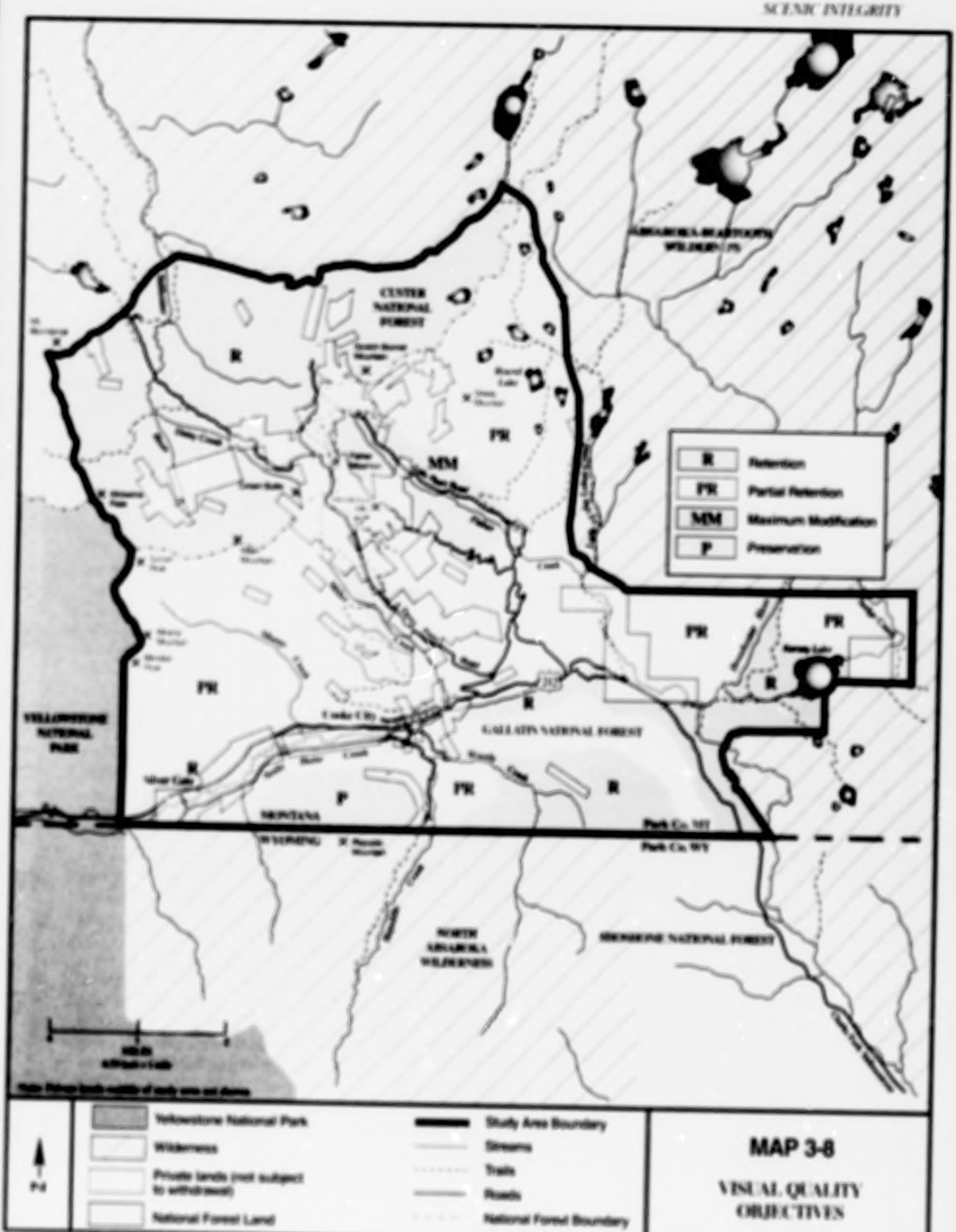
TABLE 3-8: SUMMARY OF RECREATION AND SCENIC SETTINGS IN STUDY AREA

[illegible]	[illegible]	[illegible]
Republic/Woody Creek	Very high scenic integrity, largely unaltered landscapes, distinctive features including Republic Mountain. VQO-Retention, Preservation, Partial Retention	Semi-primitive, motorized-largely undeveloped and accessed by trail. Republic Mtn recommended for wilderness. Adjacent to North Absaroka Wilderness and recommended wilderness in YNP.
US 212 in study area	Moderate scenic integrity due to developments such as cabins, powerlines, roads. VQO-Retention	Rural-convenient settings, good access; minimal difficulty. Recreation services provided in Cooke City/Silver Gate.
Sheep Creek	Very high scenic integrity; landscapes largely unaltered except by natural forces such as fire. VQO-Partial Retention	Semi-primitive, largely within Mineral Mountain portion of North Absaroka Roadless area. No formal roads or trails.
Lulu/Daisy Pass Loop Road (Fisher & Miller Crk)	Moderate scenic integrity due to past mining, roads, and timber harvest. Cultural resources add to scenery. VQO-Max Modification-Partial Retention	Roaded-natural-contact with others due to access; mineral development noticeable; interpretation signing; good viewpoints available.
Upper Stillwater/ Goose Creek	High scenic integrity, some evidence of mining; good panoramic views with little evidence of alteration, distinctive. VQO-Retention	Semi-primitive setting, bisected by Lake Abundance. 4-wheel drive trail. Partly within North Absaroka Roadless area.
Round Lake	Very high scenic integrity. Distinctive due to panoramic views and lakes. VQO-Partial Retention.	Semi-primitive, accessed via Goose Lake 4-wheel drive trail. Several lakes with fish. Beartooth roadless area.
Kersey Lake	High scenic integrity, not as distinctive landscape due to flatter, gentler ground. VQO- Retention, and Partial Retention	Semi-primitive, low standard road to Kersey Lake. Surrounded by wilderness on three sides. Several trails access wilderness. Beartooth Roadless area.



MAP 3-7

RECREATION OPPORTUNITY SETTINGS AND SCENIC INTEGRITY LEVELS



MAP 3-8

VISUAL QUALITY OBJECTIVES

Environmental Effects

Examples of mine facilities that could alter visual integrity include:

- ore-processing mill
- outdoor lighting
- tailings impoundments
- diversion channels
- a temporary waste rock storage areas
- mine adits
- reclamation borrow areas
- ventilation raises
- soil stockpiles
- access roads
- work camps
- electrical powerlines

While the analysis of potential visual quality effects is generic as the specific location or size of potential mining-related facilities is unknown, the visual impacts of the proposed New World Project will serve as example of the type of effects that could occur with future mining (NWP PDEIS, Chap. 14, Visual Resources).

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

The potential effects of mineral development on scenic integrity depend on the location and extent of future mining. If development occurs in the area of highest mineral potential in the central portion of the study area; the scenic integrity level is moderate. Effects are most noticable from area access roads such as the Lulu Pass or Daisy Pass roads. Evidence of mining, including a work camp, may be noticable from points along the Beartooth Highway. Mining disturbances may be visible from Clay Butte Lookout and other U.S. 212 vista turnouts, however the effects are ameliorated by the distance. Due to the rugged topography, most of the study area is not visible from Yellowstone Park roads. Mining-related facilities and disturbance may be visible from Republic Pass (accessable by trail) or the ridge that forms the boundary between the Park and the study area. Mining-related disturbances would likely be visible from high peaks in the surrounding area including Pilot Peak, Abundance Peak and other high points in the surrounding wilderness. (See Table 3-7, Key Observation Points.)

Mineral potential for areas like Republic Mountain, Sheep Creek, and the Upper Stillwater River is considered high. Generally, the lands available for mineral entry have high to very high scenic integrity, including roadless lands adjacent to the Wilderness or Yellowstone NP . Future exploration and development could occur on these lands increasing the risk of alteration to existing scenic integrity.

Some areas such as Republic Mountain are more sensitive to the potential effects of mineral development. Development there would be highly visible from along the Beartooth Highway (KOP) and Cooke City area.

The proposed NWP serves as an example of how mineral development could affect scenic integrity of the area (NWP PDEIS, Chap 14).

Millsites. Millsites would be about 10 acres in size. The mill complex would include ore processing facilities, administrative offices, a sewage treatment plant and sewer drain field, fuel storage tanks, mill water tanks, a snow storage area, and a pond to store water before discharge. The millsite would appear as a large industrial facility in contrast to the surrounding landscape. The mill would remain throughout operations and during the closure period. The area would be reclaimed when project operations cease.

Outdoor Lighting. Outdoor lighting equipped with reflectors designed to reflect light downward would be visible from various wilderness locations depending on the location of the mill. Night lighting may be visible from various wilderness locations including Lady of the Lake Creek and north and west of Goose Lake (KOP). Lighting would affect nighttime recreational activities, such as camping or stargazing in localized areas near the mine facilities. Lighting effects would occur during the life of the mine and cease at the end of operations.

On-site Tailings Impoundment. An on-site tailings impoundment would be one of the largest features of a mine. For example, NWP tailings impoundments could range up to 77 acres in size depending upon the alternative. The dam retaining the impoundment would be built out of crushed rock, gray to tan in color, and would be from 70 to 160 feet high. The dam for the off-site impoundment would be 30 feet tall. (Impoundment and dam characteristics would vary by alternative, additional details are discussed in NWP PDEIS, Chap. 2, Table 2-28). The tailings material would be in gray in color and would generally be covered with water during operations. The impoundment and dam would be covered with snow for 6 to 8 months per year. Both the impoundment and dam would contrast with the surrounding landscape by introducing regular geometric landforms in an otherwise naturally-appearing landscape. The visual effects of the on-site impoundment would occur throughout the life of the project. The on-site tailings impoundment and borrow area would be the dominant landform when viewed from the mine area. The on-site impoundment and borrow area in all mine alternatives except the Off-site Tailings Disposal Alternative would not meet the Forest Service's current visual quality objective for federal land affected by these facilities. These facilities would require a site-specific Forest Plan amendment.

The visual effects of the tailings impoundment and borrow area would be reduced following reclamation. The proposed revegetation plan would return the impoundment surface to near its original texture and color. The downstream faces of the impoundments would be more difficult to reclaim. Reclamation of the tailings impoundment may take many years, and may never blend with the original texture and color. The form and line of the impoundment site would be altered permanently by the impoundment imposing an unnatural geometric landform on the site.

Diversion Channel. Diversion channels would be necessary around some facilities to divert surface water around them. The channels around most facilities would be small, and would be reclaimed (regraded and reseeded) at the end of operations. In three alternatives (Crown Butte's Proposal, Modified Proposal, and Upper Fisher Creek), permanent diversion of Fisher Creek would be necessary. Because the diversion would be sized to convey the Maximum Probable Flood, the diversion channel would be about 40 feet in width at the top and 25 feet in width at the bottom. Along the bottom would be a 3-foot low-flow channel. The channel would be constructed of crushed rock.

The channel would function and appear as an engineered conveyance channel with little resemblance to a natural drainage. The large length and width of the channel would add to the channel's unnatural character and contrast with the surrounding landscape.

Waste Rock Storage Area. A waste rock storage area would be used for about a 2-to-3 year period while the tailings impoundment is constructed. The temporary site would be 10 to 15 acres in size. While the storage area is being used, it would appear unnatural, because of constant disturbance, piles of light-colored rock and lack of vegetation. After the waste rock is moved to the impoundment, the area would be reclaimed. Waste rock storage areas would not be needed with off-site tailings impoundment alternatives.

Adits. Adits or underground tunnels would provide access to the underground mine. Two of the mine adits would be near the mill and would not be visible. The existing Gold Dust Adit also would be used; it would look similar to existing conditions.

Reclamation Borrow Area. A reclamation borrow area would be about 10 acres in size and would not be excavated until the tailings impoundment is ready for reclamation. It would be located near the on-site tailings impoundment. The borrow area would be benched after use and natural plant succession would be augmented with revegetation as needed. A reclamation borrow area is not needed in off-site tailings impoundment alternatives.

Vent Raises. Vent raises would daylight above the underground mine. Each vent raise would be about 100 square feet in size. The raise opening would be small to prevent animals or people from falling into it. A guard and service structure would be constructed at the top of the raise and would block the view of the raise. The raise would also be constructed and painted to be as unobtrusive as possible. As each of the three raises would be only about 10 feet by 10 feet, they would appear unnatural, but not highly visible. Vent raises would be removed and the area reclaimed at the end of operations.

Soil Stockpile Areas. Soil stockpile areas would be needed to store salvaged soil for use in reclamation. Stockpiles would be about 30 acres in size. These stockpile areas would appear as large unnatural mounds with revegetation and plant succession atypical of the surrounding landscape. At the end of operations, the soil in the stockpiles would be used in reclamation and the area reclaimed.

Access Roads. An access road would be needed to provide access from U.S. 212 to the work camp, mill site, and the impoundment. In all mine alternatives, portions of Lulu Pass Road would be used, and some portions rebuilt to reduce road grade. The access road would be an all-weather gravel road about 25 feet in width. The proposed access road would not be returned to its pre-mine width. The widened road would introduce new cut slopes uncharacteristic of the natural landscape.

Work Camp. With Crown Butte's Proposal, the work camp would be located along lower Fisher Creek below the tailings impoundment. In all other mine alternatives, it would be near U.S. 212. This work camp location near US 212 would be visible from several nearby locations along the Beartooth Scenic Byway. The work camp, about 10 acres in size, would include three dormitories, a kitchen and food service area, a recreation building, parking, a sewage treatment plant and drain fields, a wastewater treatment plant, water tank, and snow storage areas. Buildings would be painted to reduce visual contrast. At the end of operations, the work camp area would be reclaimed.

Powerline. A 24-kV powerline would be constructed from the Cooke City substation to the work camp and mill site. The line would require 25-foot maintained right-of-way. Single poles would be erected at distances of between 35 and 45 feet. Though alignment selection and the use of appropriate materials and colors would minimize the visual effects of the powerline, it would be visible from segments and points along the access road (Lulu Pass Road or Daisy Pass Road (KOP)). At the end of operations, the 24-kV distribution line would be removed and the right-of-way reclaimed.

Effects of Future Mining on Cultural or Historical Landscapes. Future mining could affect the cultural and historic landscapes. Using the New World Project as an example, all of the mine alternatives would affect existing cultural or historic landscapes within Fisher, Miller, or Daisy creek drainages. The new mine facilities would be inconsistent with the existing historical landscape. Three mine alternatives would substantially alter the visual character of the Fisher Creek drainage: Crown Butte's Proposal, Modified Proposal, and Upper Fisher Creek.

In these alternatives, a large tailings impoundment and other mine facilities would be located in Fisher Creek. Fisher Creek contains a large number of historic sites that contribute to the overall setting and feeling of the area. With a large impoundment and other facilities in Fisher Creek, the area would no longer be able to convey a sense of time and place, or to represent a historic period.

Effects of an Open Pit Mine. There is a 10% probability that a surface or open pit mine could be developed in the study area. The visual effects would depend upon the location and size of any future mine.

Open pit mines generally result in more expansive surface disturbance than underground mines. Como and McLaren Pits are examples of open pit mining.. Both sites still contrast sharply with the surrounding landscape, in part due to difficulty in revegetating the sites.

Open pit excavation typically hollows out and creates contrast with existing landscapes. Excavation introduces dominant and strongly contrasting line, color, and texture. The excavation usually creates a visually bold landform because of the simpler, regular and strongly directional lines of mechanical work. Exposed soil would appear pale as contrasted with the nearby naturally weathered surfaces covered with vegetation.

Reclamation can blend the disturbed site back to a more natural appearing landform. Future scenic integrity would depend upon the success of reclamation including revegetation.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

Implementation of the NWM Agreement significantly reduces the potential for mineral development in the study area. Scenic integrity of the lands acquired through the NWM Agreement would be maintained or improved with planned reclamation of the Como and McLaren Pits.

Mineral potential for areas like Republic Mountain, Sheep Creek, and the Upper Stillwater River is considered high. Generally, the lands available for mineral entry have high to very high scenic integrity, including roadless lands adjacent to the Wilderness or Yellowstone NP. Future exploration and development could occur on these lands increasing the risk of alteration to existing scenic integrity. Depending upon the nature and extent of any future development, the effects on scenic integrity could be similar to those described under Scenario A-1. The probability of future development on lands remaining open to mineral entry is low (Mineral Forecast , Appendix B).

Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

Unclaimed federal land that would be subject to the withdrawal consists of generally roadless lands with high to very high scenic integrity. Scenic integrity of the Reef and Republic Mountain area, Sheep Creek, Kersey Lake and the

Goose Lake area would not be affected by mining. The potential for mining-related scenic alteration adjacent to wilderness or Yellowstone NP would be eliminated by the withdrawal.

Development likely to occur on private land and existing unpatented mining claims in the central portion of the study area would result in effects similar to those described for Scenario A-1. In general, the effects on scenic integrity would be concentrated in the area where the most alteration has occurred due to previous mining.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

The mineral withdrawal combined with the NWM Agreement would minimize any mining-related changes to scenic integrity. The semi-primitive recreation opportunity settings and roaded natural appearing and rural settings are maintained in part because scenic integrity is maintained at high levels.

Cumulative Effects Common to All Alternatives

Reclamation likely to occur under all scenarios could improve visual quality by revegetating the McLaren and Como Pits.

Development of private land could affect scenic integrity, particularly if such development occurs on private land in currently undeveloped areas. Access roads constructed to private inholdings could affect scenic integrity.

Highway construction, including gravel pits, would have a short term effect on scenic integrity.

Conclusion

Under Scenario A-1, federal lands with high scenic integrity including roadless areas and lands adjacent to wilderness and Yellowstone NP remain available for mineral entry. Potential mineral-related development, including facilities such as mills, stockpiles, tailings impoundments, workcamps, access roads, and heavy traffic on those roads, would be visually inconsistent with the surrounding landscape. While some effects occur during the life of the project and are mitigated with reclamation, others, such as tailings impoundments, could have a long-lasting effect.

Under Scenario A-2, there is a reduced potential for major changes to scenic integrity of the area. Mineral development could still occur on undeveloped lands with high scenic integrity adjacent to Yellowstone NP and the wilderness areas.

Scenic integrity of federal lands withdrawn from mineral entry would not be altered as a result of future mining (Scenario B-1). Generally, these lands are undeveloped lands with high scenic integrity. Mining is likely to occur on private land and unpatented mining claims in the central portion of the study area. Alteration to scenic integrity would be concentrated in the Daisy Pass/Lulu Pass setting. This would lead to effects similar to those described under Scenario A-1.

Scenario B-2 presents the least risk of scenery alterations, since the potential for a major mine is significantly reduced due to the combined effect of the mineral withdrawal and the NWM Agreement. Scenic integrity may be improved with additional reclamation of disturbed sites.

Yellowstone National Park

Substantive Changes Between the Draft EIS and Final EIS

In the opening paragraph of the Affected Environment section describing Yellowstone National Park, a statement was added indicating that over 2,000,000 acres of the Park has been recommended to Congress for wilderness designation, and that most of the Park, including the portion contiguous to the study area, is currently managed to maintain wilderness values.

The opening paragraph under Affected Environment, Park Operations, has been edited to clarify agreements between Yellowstone National Park and Park County, Montana.

In the opening paragraph, under the subheading "Cumulative Effects Common to All Scenarios," a statement was added to indicate that commercial traffic from Gardiner to Cooke City during the winter may decrease if year-round access is maintained to Cody, Wyoming. This same statement was also added to the Summary of Effects for Other Yellowstone NP issues.

In the second paragraph of this same section, a statement was added that some of the ascertained and potential threats to Yellowstone NP cited by the World Heritage Committee would remain even in the absence of future mining. Other potential threats were listed.

Introduction

The following section summarizes the lead agencies' analysis of potential effects of a mineral withdrawal on resources and values in Yellowstone NP. The following issues are discussed: changes in recreation, traffic, general operations, visual resources, noise; and the World Heritage Site and Biosphere Reserve designations.

For additional information on the potential effects to Yellowstone NP refer to the following sections of this EIS: Wild and Scenic Rivers, Surface Water Quality and Quantity, Aquatics, Air Quality, and Wildlife.

Affected Environment

The National Park Service (NPS) administers Yellowstone NP which borders approximately 3 miles of the southwest boundary of the study area (Map 1-2). By Act of Congress on March 1, 1872, Yellowstone NP was "…dedicated and set apart as a public park or pleasuring-ground for the benefit and enjoyment of the people" and "for the preservation, from injury or spoilation, of all timber, mineral deposits, natural curiosities, or wonders…and their retention in their natural condition."

In 1972, over two million acres of Yellowstone NP were recommended to Congress for wilderness designation. The recommended wilderness includes most of the Park except highway corridors and developed areas. The area, including the portion contiguous to the study area, is managed to maintain wilderness values (US National Park Service, 1972).

Recreation and Tourism

Visits to Yellowstone NP increased from 1986 to 1995. In 1988, visitation hit a ten year low, down 15 percent from average visits during the period. The low can be attributed to the Yellowstone fires during the summer of 1988. In 1993, visitation dropped slightly, but increased in 1994 and 1995. In 1995, visitation was slightly more than 3 million visitors. The National Park Service has projected that visitation will increase to 4.2 million visits annually by 2002. Visitation beyond the year 2002 has not been estimated by the Park Service. (National Park Service, U.S. Dept of the Interior, Fishing Bridge Draft Environmental Impact Statement.)

Of the five Park entrances, the northeast entrance receives the least number of visitors, about 5 to 7 percent of the total, but has had the greatest percentage increase in visitors. This could partially be due to rerouting of visitors from the Park's east entrance because of reconstruction and associated traffic delays, temporary closure of the east entrance road in the Park, and to the re-introduction of the gray wolf into the Lamar Valley. U.S. 14/16/20 west of Cody, Wyoming, is also undergoing reconstruction and may influence visitors to enter the Park through the northeast entrance.

Refer to the Recreation section of this Chapter, for a more detailed description of the importance of recreation in this area.

Access to the northern part of the Park is provided by two highways. U.S. 212 provides access to the northeast entrance near Cooke City, Montana, and U.S. 89 provides access to the north entrance, near Gardiner, Montana. The Mammoth/Silver Gate Highway system connects the two entrances. Yellowstone NP plans to resurface the Silver Gate to Tower Junction portion of this road beginning in 1997 (National Park Service, 1996c). Because U.S. 212 east of Cooke City is currently closed in the winter and early spring, commercial and private access is allowed through the Park between Gardiner and Cooke City.

Park planners are currently undertaking various studies to assess effects of growing recreation use. Preliminary study findings will be made available for public review sometime in 1997. Alternatives being studied include increases in certain types of use in certain places, decreases in certain types of use, and the status quo. The Park has also initiated an evaluation of summer visitor use management through completion of an Alternative Transportation Modes Feasibility Study (National Park Service, 1994). This study looks at the suitability of alternatives to the private automobile, such as bus, light rail, and monorail, for allowing visitors to enjoy the features of the Park.

Noise

Measured ambient sound levels in the Park currently range from 25 to 40 decibels. Decibels are units of measure for noise. Decibel levels associated with commonly heard sounds include 85 to 120 decibels for snowmobiles, 60 decibels for a normal conversation, and 30 decibels for a whisper. (These levels are based on the source being 50 feet away). Nighttime noise levels in the Park are lower than daytime noise levels. In areas receiving little human use in Yellowstone NP, noise levels are very low, generally below 20 decibels.

In some Park locations, traffic noise, particularly in the summer, and snowmobile noise in the winter, are audible.

In the Park's northeast corner, primary sound sources are vehicle traffic on the Tower Junction/Northeast Entrance Highway and U.S. 212; chainsaw sounds from occasional firewood cutting on private and National Forest lands near the Park's northeast entrance; and snowmobiles on private and National Forest lands adjacent to the Park. The Daisy Pass and Lulu Pass areas, about 3 miles east of Wolverine Pass, are very popular snowmobile areas. These sources of noise are typically short-term and seasonal in nature.

Park Operations

Historically, Yellowstone NP has provided many community services to visitors as well as residents of the Cooke City/Silver Gate area. Services are provided under mutual aid agreements with the state of Montana, and through a Memorandum of Understanding with Park County, Montana. For example, the NPS is reimbursed by Park County, Montana for solid waste collection. The NPS receives some reimbursement for emergency law enforcement and emergency medical services provided. The NPS also provides road maintenance and plowing of US 212 from the Park boundary (northwest entrance) to the east end of Cooke City (year-round), and spring opening, plowing and road maintenance of US 212 from Cooke City to the Montana/Wyoming state line.

Law enforcement and medical emergency services along U.S. 212 between the Park boundary and the Montana/Wyoming State line are primarily provided by NPS law enforcement services (NPS communications center with its 911 emergency call service and the NPS northeast entrance ranger station). It is common for the Park's road crew to be the first upon an accident scene and contact the necessary law enforcement or medical personnel.

Scenic Integrity

The study area is visible from some higher elevation locations within recommended wilderness along the northeast boundary of the Park. The study area is briefly visible from Park roads as you leave and enter the Park. The only Park hiking trail offering a view of the study area crosses Republic Pass about 6 miles south of the project. Existing Cooke City developments, U.S. 212, and the Daisy Pass and lower Lulu Pass roads are visible from Republic Pass. At night, lighting of Cooke City and development along U.S. 212 is visible from Republic Pass. The amount of nighttime recreational activity in this area is low.

A portion of the study area is also visible from Wolverine Peak, a high-elevation peak at the northeast corner of the Park. The number of backcountry users of Republic Pass and Wolverine Peak is low. Some historical mine disturbances, such as the McLaren Pit, are visible from Wolverine Peak. These disturbances, which are in the process of being recontoured and revegetated with native plants (reclaimed), will eventually blend with the surrounding landscape.

World Heritage Site

As a result of the International Convention for the Protection of the World Cultural and Natural Heritage adopted in 1972 by the General Conference of UNESCO (United Nations Educational, Scientific and Cultural Organization), the World Heritage Committee was established. The World Heritage Committee is responsible for implementing the principles of the Convention, to promote international cooperation in safeguarding the cultural and natural heritage of mankind. The Convention and implementing regulations require evidence that legal protections necessary to ensure the preservation of the Park and its environment are available.

Yellowstone NP was designated a World Heritage Site in 1978 for both its cultural and natural properties. The site is a cultural property because its role as the first National Park in the United States was of outstanding importance in terms of influence on subsequent National Park developments throughout the world. The Park met all four criteria for natural properties:

- Evolutionary History of the Earth: volcanism evident throughout the Park as an example of the evolutionary history of the earth;
- Evolution of Geological and Biological Processes: the hot springs and geysers as examples of on-going evolution of geological processes, and the naturally managed ecosystems as examples of on-going evolution of biological processes;
- Superlative Natural Phenomena…or Exceptional Natural Beauty: the hot springs and geysers as well as the Grand Canyon of the Yellowstone River are examples of superlative natural phenomena or areas of exceptional natural beauty; and
- Habitats Where Rare or Endangered Species of Animals Survive: Yellowstone's large area containing watersheds and intact ecosystems unaffected by human activity as examples of habitats where populations of rare or endangered species still survive.

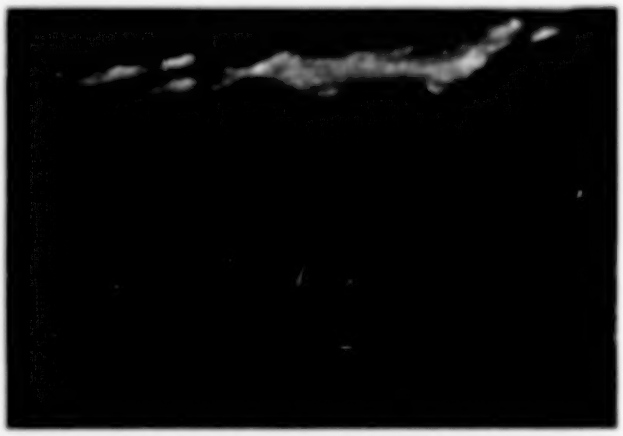
In February 1995, a group of 14 organizations requested the World Heritage Committee "…to initiate an investigation to determine whether Yellowstone NP should be included on the List of World Heritage in Danger." Their main concern focused on the threats presented to the Park by the proposed New World Project. In a letter dated June 26, 1995, responding to an inquiry from the Committee, the Assistant Secretary of the Interior wrote, "the Committee should be informed that the property (Yellowstone NP) as inscribed on the World Heritage List is in danger" (U.S. Department of the Interior, 1995).

In December 1995, the World Heritage Committee decided the following. "On the basis of both ascertained and potential dangers, the Committee decided that Yellowstone NP be placed on the List of World Heritage in Danger and that the Committee should request continuing reports on the results of the NWP EIS and mitigating actions being taken to ensure in due course the removal of the site from the List of World Heritage in Danger."

The Committee noted that potential threats to the Park related to proposed mine-related activities are effects on quantity and quality of ground and surface water. Approval of the future mining would be contingent upon compliance with the Montana Water Quality Act and the 1994 water rights compact between the State of Montana and the United States. The compact establishes the water rights of the National Park Service to all of the flow remaining in Soda Butte Creek after satisfying existing consumptive uses. Under Montana's Water Quality Act, Soda Butte Creek in the Park is considered an outstanding resource water and no degradation is allowed.

The Park as a Biosphere Reserve

Biosphere Reserves are established under the Man and Biosphere Program of the United Nations Educational, Scientific and Cultural Organization. The program is designed to provide a worldwide network of representative areas for the conservation, monitoring and research on the interaction of man and the environment, education and training, and demonstration of methods of sustainable use of ecosystems. Four criteria are used for selecting Biosphere Reserves: (1) representativeness, (2) diversity, (3) naturalness, and (4) effectiveness as a conservation entity. The Park's designation was based on the unaltered, natural condition and ecological integrity of the area. Although participation in the Biosphere Program is voluntary, Biosphere Reserves are internationally recognized as being important to the world's environment.



Soda Butte Creek, Yellowstone National Park, downstream from study area.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

Mining would increase use of the Park's recreational resources (especially in the northeast corner) to some extent. The increase would be due to the improved winter-spring access from the Cody and Billings area resulting from the snowplowing of U.S. 212 between Cooke City and Wyoming 296, increased population in the study area associated with the project, familiarity of mine workers and their families with recreation opportunities nearby, and displaced recreational users from areas near the proposed project site. Correspondingly, use of the northeast gate as an entrance into the Park would increase. The magnitude and exact location of the increase in use within the Park is very difficult to predict or quantify.

Depending on the magnitude, changes in visitation through the northeast entrance would require changes in general Park operations. The associated effects on the Park may include: increased need for road upgrading and maintenance in the northeast part of the Park, increased need for additional staff and housing near the northeast entrance, and shifting of other resources and management priorities to deal with the changing visitor patterns. The NPS would likely transfer full responsibility for community services and road maintenance in the Cooke City/Silver Gate area to Park County, Montana.

Mining would cause a slight increase in traffic through the Park due to mine workers commuting to permanent residences in Gardiner and Livingston. Traffic also could increase due to snowplowing of US 212, providing additional winter/spring access from Cody and Billings. The Park Service has authority to mitigate effects through its regulations for controlling commercial traffic through the Park. If alternate year-round access is available via US 212 and Wyoming 296, the park could restrict commercial traffic through the Park to Cooke City.

Mining-related noise, depending upon the location of the mine, could be audible in the Park. Those recreationists who hike to Wolverine Peak or adjacent ridges that form the Park's northeast boundary could hear sounds associated with mine construction, operation, and closure/reclamation. Mining-related noise, in contrast to other noise sources, typically occur 24 hours/day and throughout most of the year. Noise levels would occur during the life of mining operations in the area.

Other existing sounds from recreational driving, snowmobiling and occasional firewood cutting near the Park boundary by local residents would continue. In addition, future short-term noise would be heard in the Park. Sources include sounds from operating heavy equipment during proposed reconstruction of U.S. 212 and Park roads and ongoing reclamation/cleanup of historical mining disturbances.

Depending upon the location of future mines, facilities may be visible from the Republic Pass and the Wolverine Peak area of the Park. Similarly, night lighting would be visible during recreational activities, such as camping or stargazing, in localized areas near the mine facilities. In all mine alternatives, lighting would be designed to minimize off-site effects. Lighting effects would occur during the life of the mine and cease at the end of operations.

The visibility of the mine facilities would be in addition to existing disturbances. In all mine alternatives, the existing McLaren Pit in the short term, and portions of the Daisy Pass Road in the long term, would be visible from Wolverine Peak. Cooke City; U.S. 212, with its proposed reconstruction; and the Daisy Pass and lower Lulu Pass roads would continue to be visible from Republic Pass and adjacent areas in the long term.

World Heritage Site and Biosphere Reserve. Potential effects and mitigating actions from future mining on Yellowstone NP resources are described in other referenced chapters. Specifically regarding effects on quantity and quality of ground and surface water, the potential risks are described in detail in Sections 3, Surface Water Quality and Quantity. It would be up to the World Heritage Committee to make the determination whether those described potential effects from the mine, individually or cumulatively with the other potential and ascertained threats identified by the Committee, would cause the Committee to retain the Park on the List of World Heritage in Danger, remove the Park from the List of World Heritage in Danger, or to delete the Park from the World Heritage List.

Future mining would not have any effect on the Cultural properties, geothermal features and scenic beauty of Yellowstone NP. Potential effects of future mining on grizzly bears (classified as a threatened species under the Endangered Species Act), the gray wolf (classified as a nonessential experimental population under Section 10(j) of the Endangered Species Act), and other wildlife species is located in the Wildlife section. The consultation process between the U.S. Forest Service and U.S. Fish and Wildlife Service regarding threatened and endangered species is discussed in Appendix E.

It would be up to UNESCO/Man and His Biosphere, the body responsible for designating the Park as a Biosphere Reserve, to make the determination whether the potential effects and risks associated with mining merit withdrawing the Park from the Biosphere Reserve network.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

Under the terms of the NWM Agreement, the area with the highest mineral potential would not be available for mining. However, federal lands adjacent to Yellowstone NP would remain open to mineral entry. Future mining could occur near the Park resulting in effects described above as well as in other sections of this EIS. However, the likelihood of a major mine is significantly reduced with the NWM Agreement. Therefore, there is less risk of potential resource effects or changes to the current situation from future mining.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented *mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.*

With this Scenario, federal lands immediately adjacent to Yellowstone NP would not be available for mining. Existing levels of scenic integrity and recreation settings would not change as a result of mining. However, mineral development in the central portion of the study area including the NWP could have effects to Yellowstone NP similar to Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

The mineral withdrawal combined with the NWM Agreement results in the effective withdrawal of over 99% of federal lands, and up to 1,700 acres of private land with high development potential. The likelihood of a major mine is very low with this Scenario. Consequently, this option tends to maintain the status quo in terms of potential effects to Yellowstone NP. The risk of potential conflicts from noise, artificial lights, increases in local population, changes to visitation, and changes to water quality and quantity are significantly reduced.

Introduction of mining-related noise to the Park would not likely occur. Existing sound sources, such as snowmobiles in the winter and noise from highway traffic, would remain. Future short-term noise sources include sounds from heavy equipment used in continuing cleanup and reclamation of historical mine disturbance in Daisy Creek drainage. These would be audible to visitors to Wolverine Peak, probably during the summers for a 1- to 2-year period.

Views from any Park location are less likely to be affected by future mining. The existing McLaren Pit would still be visible from Wolverine Peak in the short term. Cooke City, U.S. 212, with its proposed reconstruction, and the Daisy Pass and lower Lulu Pass Roads would continue to be visible from Republic Pass and adjacent areas in the long term.

The Proposed Action would reduce the risk of potential adverse effects on the Park's resources, values, and characteristics for which it was designated a World Heritage Site and a Biosphere Reserve.

Cumulative Effects Common to All Scenarios

Visitation to the Park would continue to increase. The increase in visitors would increase stress on Park resources. Commercial traffic through the Park to Cooke City in the winter would continue, unless year-round access to Cody is available. With an alternate access route, commercial traffic from Mammoth to Cooke City could decrease or be eliminated during the winter months. Traffic on the Mammoth/Silver Gate Highway would continue to increase during summer/fall months in response to increased Park visitation. Highway reconstruction projects in Yellowstone Park and on U.S. 212 would reduce accidents and improve access.

Some of the ascertained and potential threats to the Park cited by the World Heritage Committee would remain at least for the near future, even in the absence of future mining. These threats relate to the endemic Yellowstone cutthroat trout, sewage leaks and waste contamination in certain areas of the Park, road construction and visitor pressures, and threats to the bison population posed by brucellosis control measures. It would be up to the World Heritage Committee to decide whether to change the status of Yellowstone NP on the List of World Heritage in Danger.

Conclusion

Mineral development forecasted for Scenario A-1 poses the risk of water quality and quantity changes to Soda Butte Creek. Underground mines in the Miller Creek drainage could contaminate ground water due to the potential for acid rock drainage. Risks can be reduced but not eliminated by design and enforcement of standards. Future mining may slightly reduce streamflows in Soda Butte Creek. However, a water rights compact between Yellowstone NP and the State of Montana requires that any flow reduction be mitigated. Tributaries to Soda Butte Creek including Sheep, Woody, and Republic Creeks remain available for mineral entry. Any future development could effect water quality in Soda Butte Creek.

With Scenario A-2, the risk of water quality, quantity and streamflow changes in Soda Butte Creek would be reduced because the area of highest mineral potential is no longer available for mining. Mining that could occur in portions of the drainage that remain available for mineral development could pose a risk to water quality and quantity in Soda Butte Creek.

Sheep, Woody and Republic Creek drainages are largely withdrawn from mineral entry under Scenario B-1. Mining likely to occur in the Miller Creek drainage on private land and unpatented mining claims poses a risk to ground water quality and flow reductions as described above for Scenario A-1.

Scenario B-2 poses the least risk to water quality impairment or flow reduction in Soda Butte Creek, since the potential for future mining is very low.

Summary of Effects for Other Yellowstone NP Issues

Park Operations. The development of a major mine is likely if the NWM Agreement is not implemented. Plowing snow off US 212 east of Cooke City would increase winter and spring traffic to the northeast corner of Yellowstone NP, increasing recreation use. Year-round access via Cody may reduce commercial traffic through the Park as an alternate route would be available. There may be an increased need for road upgrading and maintenance in the northeast part of the Park, for additional staff and housing near the northeast entrance, and for shifting of other resources and management priorities to deal with changing visitor patterns. The development of a mine may lead to additional need for services currently provided by the NPS. Mitigation associated with the development of a mine may help provide for these services.

With Scenario B-2, US 212 would not be plowed resulting in no increase in winter/spring traffic due to snowplowing. Traffic increases related to an influx of mine workers would not occur. Winter recreation will continue to increase in Yellowstone NP but at a slower rate than if there was year-round access from Cody/Billings. Local communities, Park County and the NPS will continue to need a long term solution to providing services in the area. Changes in Park operations due to mine development would not be necessary.

Visitation/Visitor Experiences: Noise, Scenic Integrity. If a major mine is developed (Scenario A-1, B-1), visitation may increase due to year-round access and the increase in local population associated with a mine. There is no evidence to suggest a decline in visitation to Yellowstone NP would occur due to mine development. Depending upon where development occurs, noise from mining activity may be heard from ridges along the Park boundary, and mine facilities may be seen from Yellowstone NP in the Republic Pass or Wolverine Peak area. Artificial lighting would be visible at night from these locations.

Under Scenario B-2, introduction of mining-related noise, scenic alterations, increases in traffic, and population increases are least likely to occur.

Air quality and visibility. Yellowstone NP is designated as a Class 1 airshed under the Prevention of Significant Deterioration (PSD) program of the Clean Air Act. Air quality and visibility standards in Yellowstone NP are not expected to be exceeded due to mining activities.

World Heritage Site and Biosphere Reserve. If a major mine is developed in the Henderson Mountain area (Scenario A-1, B-1) there is risk of water quality and quantity changes in Soda Butte Creek. Potential adverse effects to water quality and quantity have been summarized previously. Scenario B-2 reduces the potential for future mineral development and any associated effects in the Soda Butte drainage. The Park's status on the List of World Heritage sites in danger is determined by the World Heritage Committee. There is no effect anticipated on the Biosphere Reserve designation for Yellowstone National Park.

Wilderness

Substantive Changes Between the Draft EIS and Final EIS

In the Introduction, a statement was added describing the wilderness status of Yellowstone NP.

A section was added at the end of the Introduction discussing the areas that were excluded from the Absaroka-Beartooth Wilderness.

A section on Cumulative Effects Common to All Alternatives has been added.

Introduction

The proposed withdrawal area is bordered on the east, north, and west by the Absaroka-Beartooth (A-B) Wilderness. The North Absaroka Wilderness on the Shoshone National Forest borders the study area to the south. With the exception of the highway corridor, lands within Yellowstone NP west of the study area are recommended for, and managed as, wilderness. The Wilderness Act directs land managing agencies (such as the U.S. Forest Service) to protect the natural character of the wilderness and to provide for recreational, scenic, scientific, educational, cultural, and historical uses of wilderness. The Wilderness Act defines four requisite attributes of wilderness including natural integrity, apparent naturalness, outstanding opportunities for solitude, and opportunities for primitive recreation.

These attributes are applied to the conditions inside the boundaries of the wilderness. Although the experience of wilderness visitors might be affected by activities outside the wilderness boundary, the Wilderness Act does not require that adverse effects associated with those activities be mitigated.

The final boundaries of both wildernesses were established for many reasons. The most obvious were to include those areas with most outstanding wilderness qualities. The study area was excluded due to presence of private land, access roads, and mineral potential. The boundaries were also adjusted to fit the terrain and facilitate management of the area. Areas were also excluded to provide for non-wilderness values such as motorized recreation and to allow for wildlife habitat improvement projects.

The House of Representatives Report on Designating the Absaroka-Beartooth Wilderness, Custer and Gallatin National Forest, in the State of Montana, (Report No. 95-927), stated:

> "Although the area does contain significant mineral values, several areas containing active mining claims were excluded from the original wilderness proposal by the Senate Committee on Energy and Natural Resources."

Mineralized areas deleted from the bill included 800 acres in the vicinity of Independence Creek and portions of the West Fork of the Stillwater River. The study area, including the New World Mining District, was not considered for wilderness designation in either the Senate or House Bill. 150 acres were excluded near Goose Lake to provide for a more definable boundary, and 1400 acres were excluded near Kersey Lake to exclude 160 acres of private land and to provide for snowmobile use. The mineral potential of the New World Mining District was recognized in the House and Senate reports.

Absaroka-Beartooth Wilderness north of study area, near Goose Lake.

Affected Environment

Absaroka-Beartooth (A-B) Wilderness

There are 580,562 acres of this wilderness on the Gallatin NF and 346,812 acres on the Custer NF. This wilderness includes the Absaroka Range to the west and the Beartooth Range to the east. The Beartooth Mountain Range contains some of the most rugged terrain in Montana. Elevations range from 5,200 feet on the Stillwater River to 12,800 feet on Granite Peak. Peaks, glaciers, deep canyons, and high tundra plateaus dominate the landscape. Numerous lakes dot the high and often treeless plateaus.

In 1995, total recreation use reported for the Wilderness was 514,000 RVD's (Recreation Visitor Days), the most heavily used wilderness in the Northern Region of the Forest Service. The study area serves as a wilderness portal to 11 trails that access the A-B Wilderness including the popular Clarks Fork Trail (USFS #567), Lady of the Lake Trail (USFS #31), Goose Lake Trail (USFS #25), and Lake Abundance Trail (USFS #84).

Grizzly bear are found along the southern boundary of the Absaroka-Beartooth Wilderness. Two rivers, the Stillwater and the Clarks Fork of the Yellowstone originate in the study area and enter the A-B Wilderness. Upon leaving the study area, 20 miles of the Stillwater River and about 1.5 miles of the Clarks Fork flows through the A-B Wilderness. No degradation in water quality is allowed where these rivers enter the Wilderness as defined by Montana water quality regulations.

North Absaroka Wilderness

The North Absaroka Wilderness is situated along the northeastern boundary of Yellowstone NP, just south of the study area in Wyoming. The Wilderness is 350,488 acres in size and accessed by 217 miles of trails.

Terrain is characterized by rugged mountains of volcanic origin, dissected by numerous creeks. Due to the volcanic geology of the Wilderness, there exists only a handful of very small lakes. The numerous streams contain fisheries for cutthroat, rainbow, brook, and brown trout. There are populations of bighorn sheep, elk, moose, and grizzly bear. Golden eagles are frequently observed and marmots and pika inhabit the talus slopes of the subalpine and alpine ecosystems within the Wilderness.

The main use of the North Absaroka Wilderness is for primitive recreation, with some livestock grazing taking place. The Republic Creek Trail provides access from the study area to the Wilderness.

Environmental Effects

Sources of potential effects include changes in wilderness water quality due to potential mining upstream in the study area. Artificial lighting and noise from mining operations could affect solitude and primitive recreation within the Wilderness. Population increases associated with mine development could lead to increased wilderness use and reduced opportunity for solitude.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

A mine proposal would not directly disturb any lands managed as wilderness. Mining or mining facilities such as tailings impoundments are possible in the upper Stillwater and Clarks Fork drainages that eventually flow into the Absaroka-Beartooth Wilderness. No degradation of water quality is permitted for waters that enter wilderness. With water treatment and other mitigation, surface water quality standards would be met. However, risk factors including potential for acid-rock drainage, uncertainty about the ability to treat all ground water contamination, and potential failure of facilities or planned mitigation all pose risks to water quality in wilderness (Appendix H, Failure Modes Effects Analysis). The severity, nature, and extent of any effects of failure would depend on several factors:

- the mode and magnitude of failure;
- proximity of the impoundment to an active stream;
- volume of tailings and effluent released;
- volume of streamflow; and
- composition of the tailings and effluent.

The wilderness experience is highly personal and individual, so the effects would be perceived differently by different individuals. Potential mineral development would have adverse effects on the wilderness experience of some individuals at selected locations within the wilderness. Although some evidence of human activity already exists in the wilderness (e.g., trails, litter), three requisite attributes of wilderness experience (all except natural integrity) would be diminished during the life of the project at some specific locations in the wilderness. The effects would occur during the mine construction and operations and diminish as mine activity decreases. For the New World Project, the anticipated period of operation ranges from 15-25 years depending upon the market for minerals. Additional mines could extend the period of mine activity.

Noise from future mining and exploration could be audible at certain wilderness locations near the facilities. Noise levels would be between 20 and 40 decibels, slightly above existing noise levels, based on data collected for the NWP (a whisper is about 30 decibels). The zone of audibility within the wilderness would not be extensive (less than 1 mile from the mine area). Noise levels would be greater during construction (diminishing as you proceed into the wilderness), would last during mine and reclamation operations, and would cease at the project's completion.

There may be slight effects on air quality (fine particulates) due to increased dust and emissions. The increase probably would not be measurable at most locations. The increase would not affect the natural integrity or apparent naturalness of the wilderness areas. Changes in air quality would occur during periods of active mining and reclamation, and cease at the end of operations.

If a mine would operate on a 24-hour basis, light and glare at the mill and work camp would be visible from some wilderness locations. Lighting would affect nighttime recreational activities, such as camping or stargazing in localized areas near mine facilities. Lighting can be designed to minimize off-site effects. Lighting effects would occur during the life of the mine and cease at the end of operations.

Roads and mine facilities might displace recreational users of the wilderness, particularly those seeking solitude and primitive recreation, because of the mine-related traffic and noise. Effects on solitude and primitive recreation would continue during the life of the mine and cease at the end of the reclamation phase.

The increased human population associated with mining and the familiarity that project workers would have with the recreational opportunity near the mine area are likely to increase recreational use in the wilderness. The extent and magnitude of change in recreational patterns in the wilderness are uncertain and difficult to quantify. Increased recreation use would be greatest during operations, and diminish at the end of operations as mine workers move to seek other employment. Some people who move to the area because of project-related employment might remain in the area. The long-term effect on recreation and opportunities for solitude in the area also is uncertain and difficult to quantify.

Lands immediately adjacent to wilderness remain open to mineral entry. If mineral development occurs closer to the wilderness boundary, effects, particularly noise and lighting, could be more noticeable.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

The NWM Agreement reduces the risk of potential adverse effects due to mining as the highest mineral potential area is no longer available for mining. The risk of adverse effects to wilderness including noise, artificial lighting, water quality impairment, and increasing use are decreased. Lands immediately adjacent to wilderness remain available for mineral entry. If mineral development occurs closer to the wilderness boundary, effects, particularly noise and lighting, could be magnified. If a major mine would be developed on these lands, effects could be similar to those described for Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

Roadless areas adjacent to the Wilderness would be included in the withdrawal, eliminating the risk associated with mining-related development on federal lands next to the Wilderness. Development is likely in the central portion of the study area on private land and existing unpatented mining claims. Effects of development on private land and unpatented mining claims is considered under Scenario A-1. While the mineral withdrawal affords protection to lands adjacent to wilderness, development that could occur in the central part of the study area could effect wilderness values and primitive recreation opportunities.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

The mineral withdrawal combined with the NWM Agreement would essentially preclude any major mine development. Under this Scenario the existing wilderness character and primitive recreation opportunities are not likely to change as a result of future mining. This option presents the least risk of potential conflict due to mining-related noise, artificial lighting, air quality, increasing local population, and water quality concerns.

Cumulative Effects Common to All Alternatives

Wilderness water quality may improve with planned mine reclamation. Wilderness use is likely to increase in conjunction with overall increases in area recreation. Depending upon user preferences and values, increasing use may result in a loss of solitude.

Conclusion

Under Scenario A-1, federal lands immediately adjacent to the wilderness remain available for mineral entry. Noise and artificial lighting from a mine would affect wilderness experiences and solitude. In general, effects are most noticeable near the wilderness boundary and diminish deeper into the wilderness. Increased population associated with mining could lead to increased localized use, however, other visitors may be displaced due to industrial activity in the area. Potential mining development in the drainages of the Upper Stillwater and Clarks Fork Rivers poses a risk to future wilderness water quality.

Under Scenario A-2, the potential for effects to wilderness would be reduced, since the highest mineral development potential area is no longer available for mining. However, if development occurs on lands adjacent to the wilderness, effects could be similar to those described for Scenario A-1.

Under Scenario B-1, roadless areas would be withdrawn, maintaining an area of undeveloped land next to the Wilderness. While this reduces the risk of potential adverse effects to wilderness, mining development likely to occur in the central portion of the study area would result in effects similar to those described for Scenario A-1.

Implementation of the NWM Agreement combined with implementation of the mineral withdrawal (Scenario B-2) significantly reduces the potential for major mine development. This Scenario presents the least potential for mining-related conflict due to noise, artificial lighting, water quality impairment, and the increasing populations in the local area.

Inventoried Roadless Areas

Substantive Changes Between the Draft EIS and Final EIS

In the Affected Environment, under both the Beartooth Roadless Area and the North Absaroka Roadless Area, a sentence was added indicating motorized travel off designated routes, with the exception of snowmobiles, is not permitted.

In the Affected Environment, under the Reef Roadless Area, a sentence was added indicating there are no restrictions on off-road/trail motor vehicle use.

In the discussion of the effects of Alternative Scenario B-2, a section on motorized use has been added.

A section on Cumulative Effects Common to All Alternatives was added.

Introduction

Inventoried roadless areas refer to a National Forest area which 1) is larger than 5,000 acres or, if smaller than 5,000 acres, is contiguous to a designated wilderness; 2) contains no developed road, though there may be primitive 2-track motorized trails; and (3) has been inventoried by the Forest Service for possible inclusion in the wilderness preservation system. Within the study area, there are four inventoried roadless areas covering 12,960 acres of federal lands. The roadless areas are the Beartooth, North Absaroka, Republic Mountain, and Reef. Refer to Map 3-9 for the location of the inventoried roadless areas.

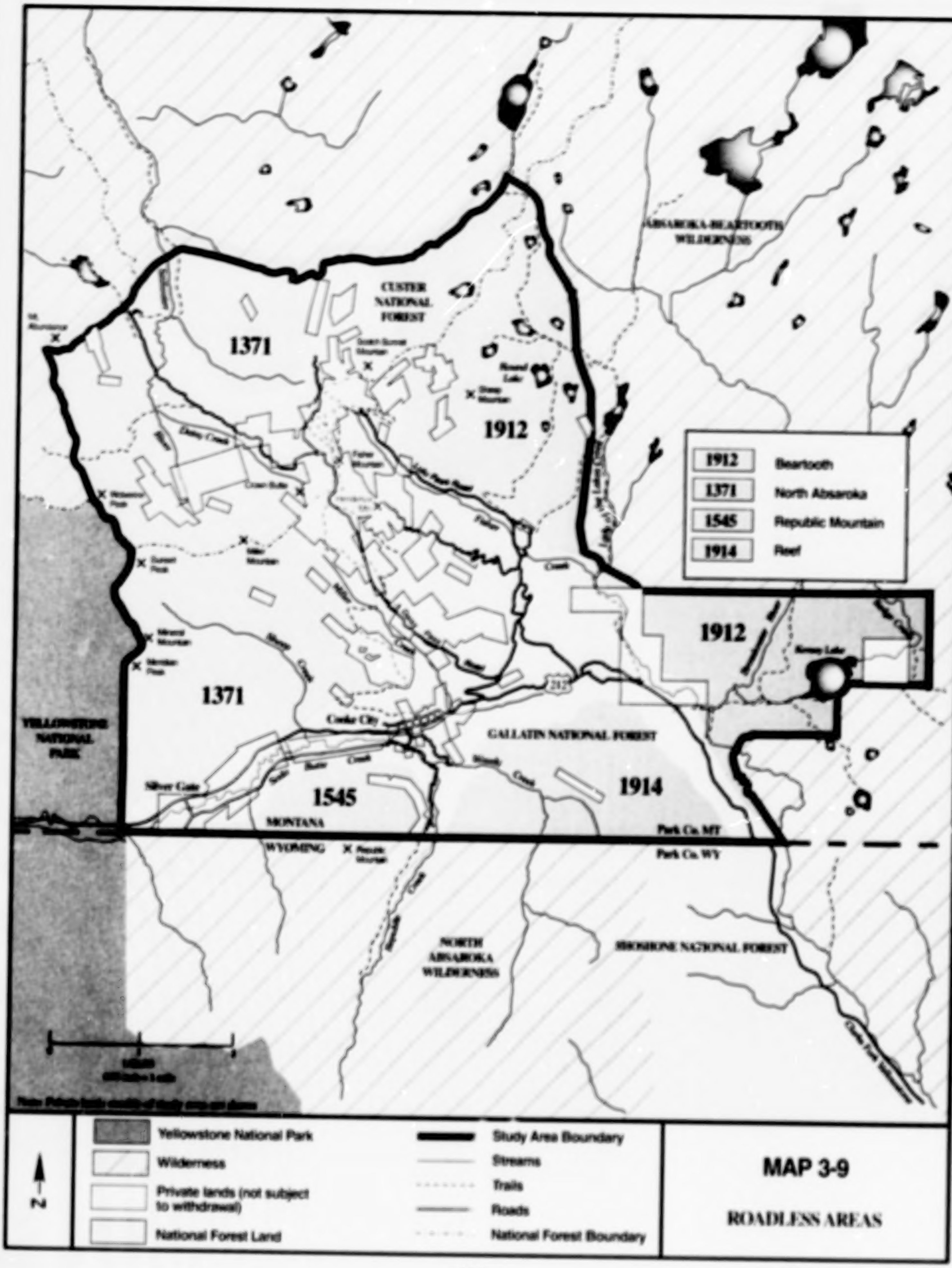
Forest Service policy has directed Forest Supervisors to address the roadless area issue in the Forest planning process. Each Forest was to determine through the Forest Plan process whether or not a Roadless Area would be recommended for Wilderness. The Gallatin Forest Plan recommended 480 acres of the Republic Mountain Area for wilderness designation. The remaining roadless areas were not recommended for wilderness, nor were any of the roadless areas in any recent Montana wilderness bills (e.g. H.R. 2799 or H.R. 2473). Those areas not recommended for Wilderness would be managed by the standards and guidelines for the Forest and the management area in which the roadless area lies.

The Forest Service established six objective criteria it considers in evaluating effects on roadless areas. These include natural integrity, apparent naturalness, remoteness, solitude, special features, and manageability and boundaries. These criteria will serve as a basis for evaluating effects to roadless areas that may occur with the alternatives under consideration in this analysis.

Affected Environment

Beartooth Roadless Area

The Beartooth Roadless Area is generally located east of Fisher Creek and the Clarks Fork River. Located in the Gallatin NF and Custer NF and contiguous to the Absaroka-Beartooth Wilderness, the area includes approximately 6,320 acres. The Kersey Lake portion of the area has a low mineral development potential while the remaining area has a moderate potential for mineral development. Approximately nine patented or private mining claims and four unpatented mining claims are within the area. Five



MAP 3-9

ROADLESS AREAS

Round Lake, Beartooth Roadless Area, northeast portion of study area.

lakes lie within the roadless area. The largest, 110-acre Kersey Lake, offers good trout fishing.

The Beartooth Roadless Area is currently affected in several ways by man-made features. The Goose Lake Road (about 5 miles long) bisects the roadless area. The road provides motorized access for four-wheel drive and off-highway vehicles (4x4/OHV) to area lakes. In the winter, the roadless area receives heavy snowmobile traffic. This road affects the area's natural integrity, apparent naturalness and remoteness. Opportunities for solitude can be found in the area away from motorized access. According to the Gallatin National Forest Travel Plan, motorized travel off designated routes, with the exception of snowmobiles, is not permitted.

Development around Kersey Lake also affects the natural integrity of the roadless area. Motorized 4x4/OHV use on roads in the summer and snowmobiling in the winter reduces the apparent naturalness and remoteness of the roadless area. Noise from U.S. 212 is audible within the portion of the area near the highway.

Under the Forest Plans for the Custer and Gallatin National Forests, all of the Beartooth Roadless Area is managed to meet non-wilderness land management objectives. Most of the area is assigned to Management Area 15 (grizzly bear habitat/dispersed recreation/grazing) with a small portion assigned to Management Area 13 (grizzly bear habitat/timber). The portion on the Custer National Forest is assigned Management Area C, grizzly bear emphasis.

North Absaroka Roadless Area

Located on the perimeter of the Absaroka-Beartooth Wilderness Area, the area is composed of 12 separate units, of which two units, Mineral Mountain on the Gallatin NF, and Mount Abundance on the Custer NF, are within the study area. The roadless area covers 3,640 acres of federal land. Two patented and 20 unpatented mining claims are located in the area. The Mineral Mountain Area, adjacent to Yellowstone NP , encompasses the Sheep Creek drainage north of Cooke City and Silver Gate. The Mount Abundance area consists of two parcels at the headwaters of the Stillwater River.

The units show evidence of past mining activity in places, but natural integrity is unimpaired in most of the areas. The northern half of the Mt. Abundance unit has moderate mineral development potential. The rest of that unit and all of the Mineral Mountain unit has a high mineral development potential. Opportunities for solitude within the unit are only fair because of the nearby towns, adjacent resource activity, and limited size. Motorized use such as snowmobiling is heavy due to the proximity of the unit to Cooke City. The unit has more motorized (primarily snowmobiling) use than nonmotorized use. Motorized travel off designated routes, with the exception of snowmobiles, is not permitted.

Under the Forest Plans, the North Absaroka Roadless Area is managed to meet non-wilderness land management objectives. On the Gallatin NF, the area is assigned to Management Area 15 (grizzly bear habitat/dispersed recreation). The portion on the Custer NF is assigned Management Area C, grizzly bear emphasis.

Reef Roadless Area

The Reef Roadless Area consists of 2,300 acres located southeast of Cooke City and south of U.S. 212. Located on the Gallatin NF, the area is contiguous to the North Absaroka Wilderness in the Shoshone National Forest to the south. About 100 acres of private land are in the Reef Roadless Area. This inholding is an inactive, patented mining claim, where evidence of old placer mining and an access road may be found. The area has high mineral potential except for a small area with moderate potential. The natural integrity, remoteness, and opportunities for solitude are limited in the northern part of the Reef Roadless Area because of U.S. 212. Away from U.S. 212, the roadless area has a high degree of natural integrity.

Under the Gallatin NF, all of the Reef Roadless Area is managed to meet non-wilderness land management objectives. The area is assigned to Management Area 15 (grizzly bear habitat/dispersed recreation/grazing) and to Management Area 13 (grizzly bear habitat/timber). There are no travel plan restrictions on off-road/trail motor vehicle use.

Republic Mountain Roadless Area

This 700 acre roadless area includes the north slope of Republic Mountain. The 10,179 foot mountain dominates the area visually. Rugged terrain, including talus slides, deep ravines, and spur ridges typify the approaches to the mountain. Gentler topography prevails near the highway to the north and on the east side of the area along Republic Creek. This fringe contains most of the area's tree cover.

The area is just southwest of Cooke City, Montana, and is well accessed by Highway 212 on the north and by the Irma Mine jeep road on the east. Natural integrity of the area is affected by old mine workings in a few places, generally in the form of exploration pits, drill holes, and the like. Generally, impacts from previous mining are confined to the flatter areas along the north and east boundaries of the area and do not extend to the steeper slopes. Approximately five patented and two unpatented mining claims are located within the area. The entire area is rated high potential for locatable minerals. The area is classified for Situation 1 management of the grizzly bear, providing critical habitat for the bear.

The Gallatin NF Plan allocated the area to Management Area 4, recommended wilderness, and to Management Area 15 (grizzly bear habitat/dispersed recreation).

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

Under the No Action Alternative, roadless areas remain open to mineral entry. The effects on the four roadless areas depends upon the location and extent of future mineral development. The area of highest mineral potential is located outside roadless areas in the interior of the study area. The Republic Mountain, North Absaroka, and Reef Roadless Areas all have high mineral potential. Most of the Beartooth Roadless Area has moderate to low mineral development potential.

Without a mineral withdrawal, filing of new mining claims in the roadless areas may occur. Future exploration and development is possible. Such development would affect the natural integrity, remoteness, apparent naturalness, opportunities for solitude, and manageability of the roadless areas in the study area. Mining outside of roadless areas can affect roadless area values such as solitude and remoteness. For example, noise and lighting associated with a mine could be heard or seen from surrounding roadless areas.

Mine facilities, exploration, and access roads could reduce the natural integrity and apparent naturalness of roadless areas. Exploration could occur in roadless areas with high mineral potential. At the end of operations, facilities would be reclaimed and effects on natural integrity and apparent naturalness within the roadless area would diminish. However, due to the high elevation, harsh climates and soil types, reclamation of portions of the study area is anticipated to be difficult.

A mining proposal would reduce the sense of remoteness in the roadless area. Sounds from a mine would be audible in much of the roadless areas. Heavy truck traffic would increase noise levels on local roads and in the area adjacent to U.S. 212. Truck traffic and noise would occur for the duration of the project, and cease at the end of the reclamation phase.

New roads and mine facilities might displace recreational users in the roadless areas, particularly those seeking solitude and primitive recreation, because of the mine-related traffic and noise. Effects on solitude and primitive recreation would occur during the life of mining operations, and cease at the end of the reclamation phase. For the New World Project, the anticipated period of operation ranges from 15-25 years depending upon the market for minerals. Additional mines could extend the period of mine activity. Any increase in traffic that resulted from the improved access would reduce the opportunity for solitude in the area.

The increased population associated with a mine and the familiarity that project workers would have of the recreational opportunities near the mine area probably would increase recreational use in the area. The extent and magnitude of change in recreational patterns in the roadless areas are uncertain and difficult to quantify. Increased recreation would be greatest during operations, and diminish at the end of operations as mine workers move to seek other employment. Some people who move to the area because of project-related employment might remain in the area. The long-term effect on recreation and opportunities for solitude in the area also is uncertain and difficult to quantify.

Filing of mining claims and subsequent exploration and development may reduce the size of the roadless areas. The formerly proposed New World Project serves as an example of how development affects the size and manageability of roadless areas. Depending upon the alternative selected, the range of direct effects on the Beartooth Roadless Area from the NWP are from no acres affected under 4 alternatives up to 89 acres affected under the Modified Proposal. In terms of manageability and boundaries, the development affects a larger area. The effects on manageability and boundaries of the Beartooth Roadless Area range from no effect up to a 1,750 acre reduction in the roadless area if the Modified Proposal is selected. With reclamation, the physical effects of all facilities except the tailings impoundments and access road would be less noticeable over time. Any permanent impoundments would have long-term effects on roadless areas.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

Without a mineral withdrawal, filing of new mining claims in the roadless areas may occur. Future exploration and development is possible. The effects on the four roadless areas depends upon the location and extent of future mineral development. The Republic Mountain, North Absaroka, and Reef Roadless Areas all have high mineral potential. Most of the Beartooth Roadless Area has moderate to low mineral development potential.

Mining-related development would affect the natural integrity, remoteness, apparent naturalness, opportunities for solitude, and manageability of the roadless areas in the study area. If a mine is developed, effects could be similar to those described above for Scenario A-1, depending upon the location and size of future mining-related activity.

The NWM Agreement removes the area of highest mineral potential from development. The New World Project would not be developed and additional exploration and development would not occur on 4,180 acres of federal land and up to 1,700 acres of acquired minerals. The NWM Agreement reduces the potential for mining-related effects to roadless areas. Specifically, the potential for mining-related changes include loss of solitude and the natural integrity of the area. Introduction of mining-related noise, artificial lighting, increased traffic, and increased recreation use as a result of the influx of mine workers would be less likely to occur.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

The four roadless areas are largely withdrawn from mineral entry. A few unpatented mining claims located within the roadless areas remain available for development. Roadless attributes would not likely change as a result of mining. However, development that is likely to occur on lands still available for mining could affect the solitude and recreation opportunities within roadless areas similar to Scenario A-1. The proposed NWP would affect portions of the Beartooth Roadless area as described under Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of *private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.*

Mining-related actions would only occur on certain patented lands and 60 acres of remaining unpatented mining claims on the National Forest. As most of the high potential land is no longer available for mining, development of a large scale mine is highly unlikely.

As the four roadless areas are withdrawn from mineral entry, the existing roadless area attributes and character are not likely to be affected by mining. Roadless area values for recreation and solitude, wildlife habitat, water quality, and scenery would be maintained. In the event the areas are considered for wilderness designation in the future, the roadless areas are not encumbered with additional mining claims.

With no major mines developed in the central portion of the study area, the solitude and character of the roadless areas are not likely to change as a result of mining. Intrusion of mining-related noise, artificial lighting, and increased traffic and use are less likely to occur. The Goose and Kersey Lake Roads would remain open and continue to provide motorized 4x4/OHV access through the roadless areas. These roads would continue to reduce the natural integrity, and apparent naturalness of the area. Other activities affecting attributes of remoteness and solitude would continue to increase. Motorized, use, with the exception of snowmobiles, is confined to designated routes in the Beartooth and North Absaroka Roadless areas. Therefore, the effects of increased use are confined to motorized corridors outside the winter season. Little off-road/trail motorized use occurs in the Reef and Republic Roadless areas due to the nature of the topography. The attributes of the roadless areas could be affected by the proposed cleanup of historical mine disturbances. The effect would be short term and cease at the end of the cleanup activities.

Cumulative Effects Common to All Alternatives

Development of private land within roadless areas could affect roadless area attributes due to construction of access roads and recreational cabins/structures. Private inholdings are located within all four roadless areas.

Portions of the Reef and Beartooth Roadless areas are considered suitable for timber management in the Gallatin Forest Plan (MA 13). Future timber harvest could affect roadless area attributes for these two areas. An Environmental Impact Statement would be completed prior to allowing any substantial timber harvest in roadless areas. Remoteness and solitude of roadless areas would likely be affected by anticipated increases in recreation use.

Conclusion

Mining anticipated under Scenario A-1 poses the greatest potential for change to roadless area attributes. Reef, Republic Mtn, and North Absaroka inventoried roadless area have high mineral development potential and they remain open to mineral entry. Future development would affect the natural integrity, remoteness, opportunities for solitude, and manageability of roadless areas.

The potential for increased noise, artificial lighting, increased traffic, and increased recreation use is reduced due to implementation of the NWM Agreement (Scenario A-2). However, roadless areas remain available for mineral entry, and roadless area attributes could change as a result of future mineral exploration and development.

Under Scenario B-1, withdrawn land includes most of the four roadless areas. Mining-related development would not directly threaten roadless area attributes. Development likely to occur in the central portion of the study area would affect roadless area recreation opportunities due to the introduction of noise, artificial lighting, increased traffic, and increased recreation use.

The combined effects of a mineral withdrawal and the NWM Agreement (Scenario B-2) results in the least potential for adverse effects to roadless area attributes. The existing solitude and character of roadless areas is maintained although increasing non-mine related recreation use is anticipated.

Wild and Scenic Rivers

Substantive Changes Between the Draft EIS and Final EIS

In the Introduction, a statement was added indicating the Clarks Fork of the Yellowstone River is a designated wild river located downstream from the study area, and that there are no designated wild or scenic rivers within the study area.

In the Affected Environment section, under Designated Wild River, a section has been added describing the headwaters within the study area that contribute to the Clarks

Fork of the Yellowstone.

In the discussion of the effects of Alternative Scenario A-1, under the subheading Stillwater River, a sentence was added indicating reclamation of the McLaren tailings would improve the scenic integrity of the Upper Stillwater.

In the discussion of the effects of Alternative Scenario A-1, under the subheading Effects on Water Quality, a sentence was added indicating water quality could be improved with reclamation of historical mining disturbances.

In the discussion of the effects of Alternative Scenario B-2, a sentence was added indicating water quality and quantity would not likely change as a result of future mining.

Cumulative Effects Common to All Alternatives have been identified under a separate heading.

Affected Environment

The Wild and Scenic Rivers Act affords protection to two types of rivers, designated Wild or Scenic Rivers, and Study Rivers. A designated river segment is a river segment that has been designated by the U.S. Congress or the Secretary of the Interior as a wild, scenic, or recreational river. The Clarks Fork of the Yellowstone River is a designated wild river downstream from the study area. There are no designated wild or scenic rivers within the study area. Study rivers are segments that were identified through the Act for study for their suitability for inclusion in the Wild and Scenic River System. No study rivers are in the project area.

The purpose of this section is to disclose the effects on designated Wild and Scenic Rivers. The analysis also discloses effects on segments considered eligible for inclusion into the Wild and Scenic River System. An eligible river segment is a river or creek that has been determined by a land-managing agency to be free-flowing and possess at least one outstandingly remarkable value. Land-managing agencies, such as the Forest Service or National Park Service, have developed policies to protect the values associated with river segments eligible for inclusion into the Wild and Scenic River System.

The analysis considered the four characteristics of Wild and Scenic Rivers (U.S. Department of the Interior, and U.S. Department of Agriculture, 1982):

- free of impoundments;
- generally inaccessible except by trails;
- watersheds or shoreline essentially primitive; and
- waters unpolluted

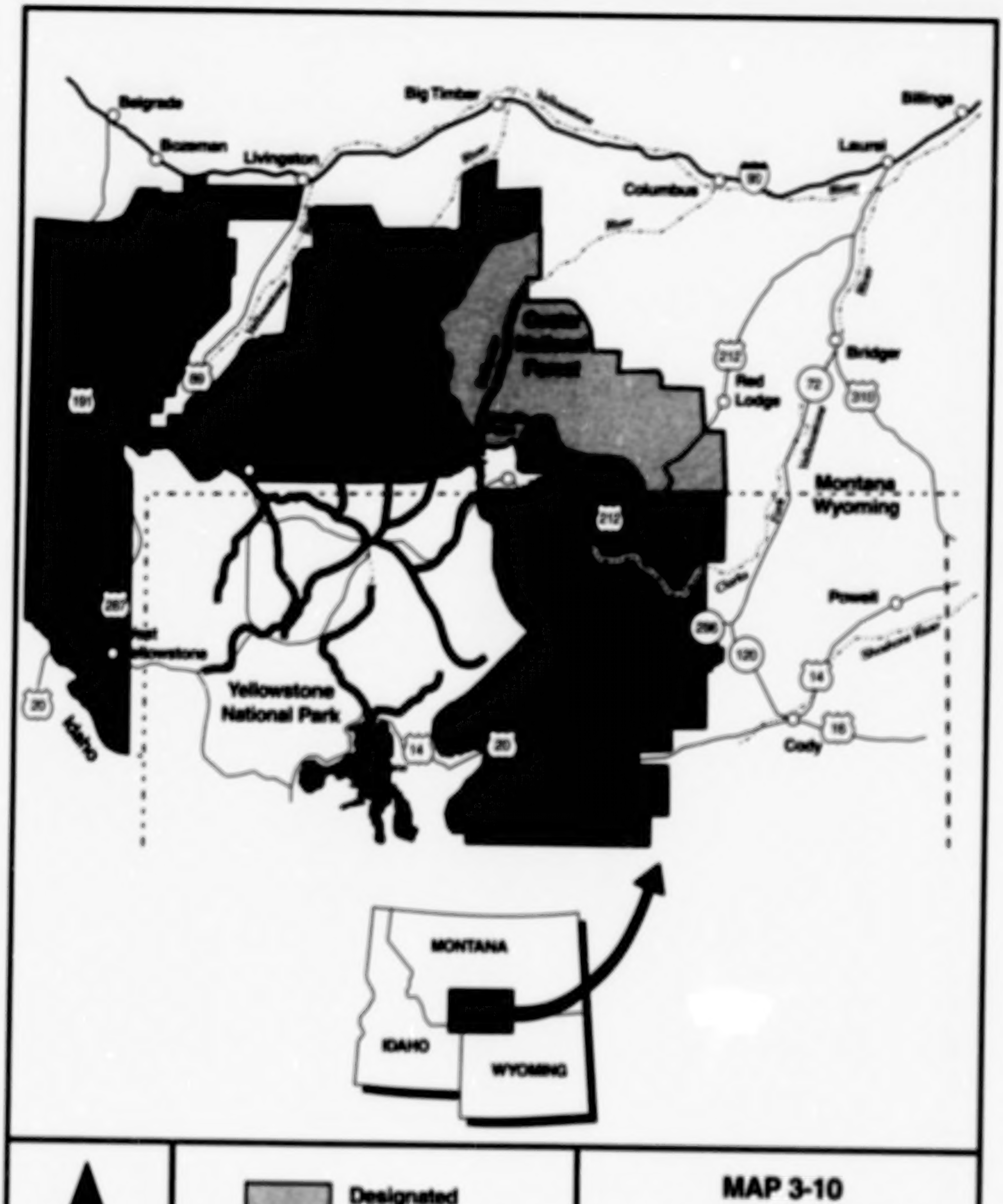
The Wild and Scenic Rivers Act also describes six outstandingly remarkable values that Wild and Scenic Rivers may possess: scenic, recreational, geologic, fish and wildlife, historical, and cultural. This analysis of Wild and Scenic Rivers considers only those outstandingly remarkable values for which a river segment is designated or considered eligible.

Designated and eligible river segments in and adjacent to the study area are shown on Map 3-10.

Designated Wild River

The designated segment of the Clarks Fork of the Yellowstone River starts about 17 miles downstream from the Montana/Wyoming border. Headwaters within the study area that contribute to the Clarks Fork include Fisher Creek and portions of the Lady of the Lake Creek and the Broadwater River. It has three outstandingly remarkable values: scenic, recreational, and historic (Shoshone National Forest, 1979). The scenic values are the deep canyon and associated rapids, waterfalls and cascades. The recre-

Clarks Fork of the Yellowstone River, with Pilot Peak in the background.



MAP 3-10

WILD AND SCENIC RIVERS IN VICINITY

ational values are viewing scenery and enjoying unique and unusual environments, such as waterforms, narrow canyon walls, and wind-blown vegetation. Traditional water-based recreation is limited by rugged access and steep gradients. The historic value is the historical use by Chief Joseph and the Nez Perce Indians in 1877 (Shoshone National Forest, 1979). The 20.5-mile-long designated corridor is 1/2-mile wide (1/4-mile from each bank). Although the designated segment provides good habitat for Yellowstone cutthroat trout, it is not considered exceptionally high quality fish habitat.

Eligible River Segments

Several eligible wild, scenic or recreational river segments are within or adjacent to the study area. Eligible river segments include:

- a 1.8 mile segment of the Clarks Fork River within the study area, just north of the Montana/Wyoming State line. The outstandingly remarkable value is scenery;
- 2.0 miles of the Stillwater River within the study area and approximately 25 miles downstream from the study area including about 20 miles in the A-B Wilderness. The outstandingly remarkable values are recreation and scenic;
- Soda Butte Creek inside Yellowstone NP. Outstandingly remarkable values include scenic, wildlife, historic and geologic values.

The Gallatin NF identified 1.8 miles of the Clarks Fork as an eligible river. The eligible segment is mostly within the A-B Wilderness with the exception of a short segment within the study area between the wilderness boundary and the Clarks Fork trailhead bridge. Fisher Creek, which has been degraded by historical mine discharges, forms the Clarks Fork after its confluence with Lady-of-the-Lake Creek. Elevated metal concentrations, particularly during high flows, are found in the upper Clarks Fork as a result of the upgradient mine discharges.

The Custer NF identified segments of the Stillwater River as an eligible Wild and Scenic River (Custer NF, 1986). The river segment within the A-B Wilderness, about 20 miles long, is eligible as a Wild River. The remaining 7.5 miles of river within the Custer NF, but outside the wilderness, is eligible as a Recreational River. This includes about 2 miles of the river upstream from the wilderness boundary in the study area. The outstandingly remarkable values are recreational and scenic. Daisy Creek flows into the Stillwater River, which enters the A-B Wilderness about 1 mile below the confluence. Water quality in the upper Stillwater River below its confluence with Daisy Creek is degraded by historical mine discharges.

The National Park Service (NPS) considers Soda Butte Creek in the Park to be eligible for designation as a Scenic River under the Wild and Scenic Rivers Act (Yellowstone NP, 1990). The headwaters of Soda Butte Creek, which enters the Park near Silver Gate, are in the study area. The NPS described the eligible segment of Soda Butte Creek as having outstanding scenic, wildlife, historic, and geologic values. Seven miles inside the Park it passes through Icebox Canyon, a narrow and steep walled cut that receives so little sun that ice remains on the walls into June each summer. Three miles above the creek's confluence with the Lamar River, it passes a large, active travertine mound, called 'Soda Butte.' It is one of very few thermal features in the northeast corner of the Park. The 'Soda Butte' was a late 19th-century landmark on the road to Cooke City, where a historic soldier station, gamekeeper's cabin, and saloon were located in the floodplain of the creek (Yellowstone NP, 1990).

Fisheries and recreational values in Soda Butte Creek have been affected for the past 50 years by poor water quality from the McLaren tailings and other historical mining activities. The McLaren tailings are in the upper part of the watershed, east of Cooke City. Below its confluence with Soda Butte Creek, the NPS considers the Lamar River eligible as a Scenic River.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented.

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

The potential effects of future mining on designated and eligible Wild and Scenic River segments depends upon the location, size and operational success of future mines. If future mines affect the outstandingly remarkable values (scenic, recreational, geologic, fish and wildlife, historic, and cultural) or the characteristics (free of impoundments, inaccessible except by trail, essentially primitive shorelines, unpolluted waters) of eligible Wild and Scenic Rivers, the rivers may no longer be eligible for designation.

With the exception of the two-mile segment of the Stillwater River and a short segment of the Clarks Fork within the study area, the other designated or eligible river segments are outside the study area. For river segments outside the study area, the primary concern is potential changes to water quality as a result of future mining. Mining within the study area would not affect the primitive shoreline or accessibility of designated or eligible segments outside the study area. Furthermore, the outstandingly remarkable values of designated and eligible segments outside the study area would not be directly affected by mining. However, if water quality upstream is seriously impaired by additional mining impacts, there could be effects on fish, wildlife, and recreation downstream from the study area within the eligible segments.

Clarks Fork. The mining activities would not likely affect the free flowing characteristics, shoreline, or accessibility of the designated or eligible segments of the Clarks Fork River. For the Clarks Fork, scenic values of either segment are not likely to be affected by future mining. Mine facilities are not likely to be visible from either segment. Scenic values are the only outstandingly remarkable value identified for the eligible segment. The designated segment has two other outstandingly remarkable values—recreational and historical. Recreational use of area resources would increase. Some of the increase might occur within the designated segment. The magnitude of this change in use is very difficult to predict or quantify. Mining would not affect historical value (historical use by the Nez Perce Indians).

Soda Butte Creek. Future mining would not affect the shoreline or accessibility of the eligible segments of Soda Butte Creek. The eligible segment of Soda Butte Creek is in Yellowstone NP, west of Cooke City. Future mining could effect water quality in Soda Butte Creek as described later in this chapter. Outstandingly remarkable values of the eligible segments of Soda Butte Creek would not be adversely affected by mining unless water quality degradaion affects aquatic resources.

Stillwater River. Future mining could affect the outstandingly remarkable values and the primitive character of the shoreline and watershed for the eligible segment of the Stillwater River within the study area. As the headwaters of the Stillwater River remain available for filing of new mining claims, future development could occur. Such development could effect the recreation and scenic values identified for this river. Three alternatives under consideration for the NWP located in the Stillwater drainage would not comply with the current visual quality objective of retention, either during or after operations. The tailings impoundments would be visually inconsistent with the surrounding landscape. The scenic value of the area as seen from this part of the corridor would be reduced in both the short and long term. In the long term, reclamation of the tailings impoundments and other mine facilities would reduce the adverse visual effects. The impoundments would not be visible from other segments of the river, and the scenic values would not be affected in the lower segments of the drainage.Reclamation of the McLaren tailings would improve the scenic integrity of the Upper Stillwater.

Effects on Water Quality. Mineral development in the area of highest mineral potential, including the NWP could affect water quality in Fisher, Miller, Daisy, and upper Soda Butte Creeks. Water quality effects could consist of an increase in sediment, metal, TDS, nitrate, and sulfate. Mine development would not likely affect the eligibility of the Upper Clarks Fork, Soda Butte Creek, and the Stillwater River for inclusion into the Wild and Scenic Rivers System. With mitigation required by the water rights compact between the State of Montana and the United States, flows and water quality in Soda Butte Creek would not appreciably change. Water quality could be improved with reclamation of historical mining disturbances.

Treatment may be required to meet Montana B1 water quality standards, and non-degradation at the Yellowstone NP boundary to comply with the water rights compact (no change in Soda Butte Creek at the Park boundary) and Outstandingly Natural Resource water designation (non-degradation) of Soda Butte Creek at the Park boundary. Any water quality changes in Fisher Creek could affect water quality in the Wild River segment of the Clarks Fork River although the change would be highly diluted and subject to non-degradation requirements in Montana and Wyoming.

Because changes to ground water quality from mine workings is impossible to predict with certainty, mining companies would need to monitor water quality and discharge of springs and seeps. If mine-related spring discharge does not comply with surface water quality standards, a water treatment program would need to be implemented for as long as necessary to meet standards and protect water quality. Refer to the section on Water Quality under SURFACE AND GROUND WATER, WETLANDS AND FLOODPLAINS for a more detailed description of effects. Failure of a major mine component could affect water quality of designated and potential wild and scenic rivers. Appendix H, Failure Modes Effects Analysis, summarizes the likelihood and consequences of potential failures.

Future mining could reduce 100 year low flows in Miller Creek and upper Soda Butte Creek. For the New World

Project , 100 year low flow depletion for Soda Butte Creek at the Yellowstone NP boundary would be less than 1%. Streamflow would need to be augmented to Soda Butte Creek to offset any reductions at the Yellowstone NP boundary. To accomplish this, mining companies would have to obtain water rights with current consumptive use, retire the water use, and make the water available to the Soda Butte Creek drainage.

The mining activities would not likely cause any additional mine related effects on water quality or streamflow in Soda Butte Creek beyond that which has been occurring for decades from historical mine activity near Cooke City. The McLaren tailings and other sources of metals near Cooke City would remain in the upper part of the Soda Butte watershed, and would continue to seasonally affect water quality in Soda Butte Creek in Yellowstone NP. Reclamation of existing mining disturbances in upper Miller Creek could improve Miller Creek water quality with a slight reduction in Soda Butte Creek metal loadings at the Yellowstone NP boundary.

Projected changes in the streamflow and water quality for the New World Project would not be measurable in the designated segment of the Clarks Fork Wild and Scenic River in Wyoming. The addition of a new underground mine would raise the potential for measurable water quality and streamflow effects which would be constrained by water quality and non-degradation standards. Mine construction could alter the timing of streamflows in the designated or eligible segments of the Clarks Fork River with lower (about 0.5 cfs) winter flows and slightly higher peak flows. Several New World Project alternatives would increase concentrations of total dissolved solids, hardness, sulfate, nitrate, and ammonia but the increase would still comply with water quality standards. In the New World Project alternatives, collection and treatment of the Glengarry adit discharge would decrease metal concentrations in the eligible Clarks Fork segment. All mines in this alternative would also temporarily increase sediment discharge by up to 5% in the designated section of the Clarks Fork River which would gradually reduce to pre-mining levels as disturbed areas stabilize and revegetate and mining areas are reclaimed.

Cleanup of the historical mine disturbances in Fisher Creek, including removing and treating of adit waters, and reclamation of abandoned roads, drill pads, and tailings, would improve the water quality of the mining area by reducing acid mine drainage. Cleanup of Fisher Creek would eventually increase pH and reduce the concentrations of metals, sulfate, suspended sediment, and dissolved solids. This would result in a slight improvement in water quality of the Clarks Fork River in the designated Wild River section. Cleanup of the McLaren pit and associated mine drainage would substantially improve water quality in Daisy Creek with moderate improvement to the water quality in the eligible section of the Stillwater River.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

Risks to water quality impairment of designated and eligible Wild and Scenic rivers is reduced due to the NWM Agreement. The NWP as well as other potential development would not occur in acquired lands which include the area of highest mineral potential. If a mine were developed, effects could be similar to those described previously for Scenario A-1, depending upon the location and size of the mine.

The 17,820 acres of federal land that remains available for mineral entry includes the eligible portions of the Stillwater River and Clarks Fork within the study area. Future mining could affect the outstandingly remarkable values and the primitive character of the shoreline and watershed for the eligible segment of the Stillwater River and Clarks Fork within the study area. Such development could effect the recreation or scenic values identified for these rivers.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

Withdrawing federal lands would reduce the potential for streamflow or water quality changes to designated or eligible Wild and Scenic Rivers. However, the area of highest mineral potential in the central portion of the study area would remain available for development. Development of the NWP as well as other possible mines would lead to effects similar to those described for Scenario A-1 above.

The outstandingly remarkable values and the essentially primitive shoreline of the Stillwater and Clarks Fork River within the study area are less likely to change as a result of the withdrawal. Lands adjacent to the eligible segments would be withdrawn from mineral entry.

This Scenario would reduce the availibility of adjacent federal land for NWP facility sites, and require facility development on private land and on existing, unpatented mining claims. This could result in more environmentally impactive locations for some of the NWP facilities, and increase the risk of adverse water quality impacts to Yellowstone NP and the Clarks Fork River.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

The risk of changes to streamflows and water quality from future mining to designated and eligible river segments would be significantly reduced due to the combined effects of the mineral withdrawal and the NWM Agreement. Only 60 acres of federal land and 2,200 acres of private land remain available for mining, and no mines are forecasted. The outstandingly remarkable values of rivers within the study area would not be affected by mining. Water quality and quantity would not likely change as a result of future mining.

Cumulative Effects Common to All Alternatives

Past mining activities have altered water quality in Soda Butte Creek in Yellowstone NP, the Clarks Fork, and eligible sections of the Stillwater River. Water chemistry and sediment reduction improvements associated with reclamation of existing mining disturbances would be expected to result in minor water quality improvements in the Clarks Fork and Soda Butte Creek and moderate water quality improvement in the upper Stillwater River. Reconstruction of Highway 212 from the northeast entrance of Yellowstone NP to the Montana/Wyoming border would cause cumulative temporary minor sediment increases to Soda Butte Creek in Yellowstone NP and the Clarks Fork River. These sediment increases (less than 5%), would be similar to sediment levels which have occurred with the numerous highway reconstruction projects in Yellowstone NP and the Clarks Fork River in the Shoshone National Forest. The other reasonably foreseeable activities identified in Appendix C would not be expected to result in cumulative water quality effects.

The anticipated cleanup of historical mine-related disturbances in the headwaters of the Clarks Fork would be designed to improve water quality. The improvement would be more pronounced in the eligible segment. It is not known whether aquatic life standards would be achieved in the eligible segment of the Clarks Fork River. If cleanup does not achieve aquatic life standards, fishing would remain impaired.

The McLaren tailings and other historical mine disturbances in Soda Butte Creek would continue to degrade water quality and aquatic life in Soda Butte Creek in the Park. Very high sediment loads in the eligible segment also would continue to adversely affect recreational and fish and wildlife values. Discharges from the McLaren Pit in the Daisy Creek drainage would continue to have similar effects on water and aquatic life resources of the upper Stillwater River. Recreational fishing in these two segments would remain impaired. Cleanup of historical mine-related disturbances in the Daisy Creek watershed would eventually improve water quality in the Stillwater River. It is not known whether aquatic life standards would be achieved in the upper segment of the Stillwater River below the confluence with Daisy Creek. If cleanup does not achieve aquatic life standards, fishing would remain impaired. Outstandingly Remarkable Values would be protected.

Recreation use of area resources would increase. Some of the increases might occur within the eligible segment, such as fishing in Soda Butte Creek or the Lamar River. The magnitude of this change is very difficult to predict or quantify.

Conclusion

Mineral development anticipated under Scenario A-1 would not likely affect the eligibility of the three rivers with the exception of the Stillwater River in the study area. Mining development in upper Stillwater could effect recreation and scenic values. Free-flowing character and outstandingly remarkable values for the other eligible segments are not likely to be affected by future mine development. There is a risk to water quality of the eligible segments if mitigation measures are not effective or if a facility such as a tailings impoundment fails. Mining could slightly alter streamflows in the eligible and wild river segments.

Implementation of the NWM Agreement (Scenario A-2) significantly reduces the probability of a major mine being developed in the area. Therefore, the risks of impaired water quality or reduced flows is lessened. If a mine were developed on available federal land (17,760 acres) or on the remaining private land, effects could be similar to those described for Scenario A-1.

The mineral withdrawal would immediately affect 17,760 acres of federal land including the eligible portions of the Clarks Fork and Stillwater Rivers within the study area. Potential mining-related effects to their shorelines and the outstandingly remakable values are less likely to occur. Mineral development that could occur in the central portion of the study area on private land and unpatented mining claims poses a risk to water quality and quantity of eligible and wild river segments as described under Scenario A-1.

Scenario B-2 presents the least risk of changes in streamflows and water quality in designated and eligible wild and scenic rivers due to low probability of any major mine in the future.

Air Quality

Affected Environment

Climate

The study area is characterized by long cold winters, short cool summers, and deep snow conditions throughout much of the year. Mean frost-free period is short, about 30 days between mid-July and mid-August. Average annual precipitation is 60 inches in the higher elevations, and 27 inches in the valley bottom at Cooke City. Mean annual snowfall in the area ranges from 300 to 500 inches. Precipitation is maximum in January, and minimum in August. Summer thunderstorms are common.

Air Quality

Air quality in the study area is excellent. Yellowstone NP and the North Absaroka Wilderness area to the south were designated as Class I PSD areas under the Prevention of Significant Deterioration (PSD) program when the Clean Air Act was amended in August 1977. The A-B Wilderness, which was established in March 1978 (after the Clean Air Act was amended), is a Class II area.

Prevailing wind direction is from the southwest, although individual storm fronts can have prevailing north or south wind directions. Up valley and down valley wind patterns develop during summer. Wind dispersion throughout the study area is robust although localized inversions can develop over Cooke City and Silver Gate. The PM-10 data which Crown Butte collected during 1989-1991 (NWP PDEIS, Appendix F) includes arithmetic and maximum PM-10 in micrograms per cubic meter (ug/m3) at the McLaren mine (13 and 35 ug/m3), Fisher Creek (8 and 25 ug/m3), and Cooke City (19 and 83 ug/m3). These PM-10 values were well below the ambient standards of 150 ug/m3 (24hr) and 50 ug/m3 (annual). Projected air quality effects are based on Appendix F of the NWP PDEIS (Preliminary Determination of Crown Butte's Air Quality Permit Application), and are all well within National Ambient Air Quality Standards.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented.

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

Potential air quality mining effects in the study area are due to emissions from engines and heating equipment, and dust from roads, tailings, and disturbed areas around mine facilities. Projected air quality mining effects of the New World Project are summarized in Appendix F of the NWP PDEIS, Preliminary Determination of Crown Butte's Air Quality Permit Application. Assuming the New World mine and underground mine are not simultaneously in operation, emissions associated with surface and underground diesel exhaust, waste oil burning, and mine air heating could produce approximately the estimated emissions for the New World mine which are 49 t/y of nitrogen oxide, 23 t/y of sulfur dioxide, 20 t/y of carbon monoxide, and 14 t/y of hydrocarbons. Particulate emissions would increase slightly due to increased road dust and wind erosion of tailings material. Gaseous emissions from the open pit mine would not be expected to exceed the New World mine concentrations as neither mine would fall into PSD requirements since they would be under the 250 t/y emissions threshold that characterizes a "major stationary source". The NWP PDEIS, Appendix F projected maximum 24 hr ug/m3 PM-10 increases for the New World mine would be about 55 in the mine area, 0.12 in Cooke City, 0.07 in Yellowstone NP, and 0.46 in the Absaroka-Beartooth wilderness. Annual average PM-10 increase is projected to be 1.84 ug/m3 in the mine area, 0.13 in the Absaroka-Beartooth wilderness, and 0 in Cooke City and Yellowstone NP. All projected PM10 increases are well within compliance with National Ambient Air Quality Standards. The open pit mine would be expected to have similar nitrogen oxide, sulfur dioxide, and hydrocarbon emissions but much greater potential particulate and PM-10 emissions due to exposure of soil and tailings to high wind velocity. The open pit mine could substantially increase PM-10 levels in the mine area with a moderate increase in downwind portions of the Absaroka-Beartooth Wilderness. Road, facility, and tailings dust mitigation would be required by the Montana Air Quality Division as part of the air quality permit, and would include watering, vegetative stabilization, and/or chemical stabilization of road surfaces. Visibility impacts would be well within contrast threshold limits set by EPA.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

Air quality effects of Scenario A-2 would be similar but less in magnitude to the effects described for Scenario A-1 since the New World mine would not be developed. This alternative would include effects listed above plus future emissions. Reasonably foreseeable activities identified in Appendix C would not be expected to result in cumulative air quality effects except for increased vehicle and wood burning smoke emissions associated with additional domestic and recreational developments in the Cooke City and Silver Gate areas. Temporary increases in diesel exhaust and particulates would occur during reconstruction of Highway 212.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

Air quality effects for Scenario B-1 are similar to Scenario A-1 previously described, due to anticipated development of the NWP. The area of highest mineral potential remains available for mineral development. The 17,760 acres immediately subject to the withdrawal consists of lands immediately adjacent to Yellowstone NP and the wilderness. Mining-related disturbances that could result in degradation of air quality would not occur on these lands.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

Scenario B-2 has the best potential for air quality protection in that it would result in only minor amounts of mineral exploration but no foreseeable mine on federal lands. Air quality would have only minor and localized project related emissions from diesel drill rig exhaust and road dust. Visibility would not be affected.

Reasonably foreseeable activities identified in Appendix B would not be expected to result in cumulative air quality effects except for increased vehicle and wood burning smoke emissions associated with additional domestic and recreational developments in the Cooke City and Silvergate areas. Temporary increases in diesel exhaust and particulates would occur during reconstruction of Highway 212. The likely withdrawal effect of no new open pit mine would eliminate the large potential increase in particulates in the mine area and the moderate increase in the downwind portions of the A-B Wilderness.

Conclusion

Air quality within the study area is excellent with very limited emission sources and robust wind dispersion. Mining within the study area has relatively minor potential for gaseous or particulate emissions and limited probability for ambient air quality standard violations or adverse impacts to the Class I Yellowstone NP or the North Absaroka Wilderness. Any development of open pit mines in the north end of the study area has potential to increase dust and particulate impacts to the adjacent Class II A-B Wilderness.

LAND USE

Substantive Changes Between the Draft EIS and Final EIS

Under Current Land Uses in the Study Area, Subdivision/Residential Development, information has been added about subdivision review, septic system permit requirements, and zoning options for the Cooke City/Silver Gate area.

Under Private Lands And Unpatented Mining Claims a sentence has been added to the Affected Environment indicating effects on mineral development on private land from the withdrawal are speculative, and would depend upon the size, type and location of a future mine.

In the discussion of the effects of Alternative Scenario A-1, a sentence was added indicating filing mining claims on highly mineralized areas and millsite claims for potential facility sites would be likely without a withdrawal.

In the discussion of the effects of Alternative Scenario B-1, a section was added in response to comments on the Draft EIS expressing concerns that the withdrawal represents a "takings" of private property.

Under Forest Plan Consistency in the Affected Environment section, under the subheading Gallatin Forest Plan: Forestwide Direction, a section was added to clarify the evaluation criteria contained in Appendix D of the Gallatin Forest Plan and where it is applicable.

Introduction

Issues considered in this section include:

- Effects of the withdrawal on the availability of minerals;
- Effect of the withdrawal on mineral development potential of private land and existing unpatented mining claims;
- Effect of the withdrawal on the New World Project;
- Consistency with Forest Land and Resource Management Plans.

The current land uses, the geology of the study area, and the reclamation potential also are discussed in this section.

Current Land Uses in the Study Area

Recreation. A wide variety of year-round recreational activities occur on federal lands in or near the study area. The proximity to Yellowstone NP and the A-B Wilderness provides opportunities for wilderness recreational experiences near the study area. The study area is used during the summer for camping, mountain biking and four-wheel driving, in the fall for hunting, and in the winter for snowmobiling and cross-country skiing.

Timber and Grazing. Before the 1988 Storm Creek forest fire, timber harvesting was limited in the study area because of grizzly bear habitat requirements. From 1988 to 1993, timber harvesting increased in response to salvageable timber damaged by the 1988 fire. Recently, only occasional small-scale timber harvesting has occurred in the study area. No livestock grazing occurs in the study area.

Mining. The mineral potential of the New World District was recognized as early as 1869. Since then, companies have mined copper, gold, silver, lead, and zinc sporadically in several locations. Crown Butte has conducted mineral exploration and development activities in the mine area over the past 8 years. The area's mining history is discussed in greater detail in Cultural Resources.

Subdivision/Residential Development. The 1990 Census reported that there were 277 housing units on private land in the Cooke City/Silver Gate area. About 22 percent of the homes are occupied on a year-round basis while the remainder serve as part-time recreational homes. Since 1990 on average, three or four new residences or cabins are constructed on private land per year (Park County Planning Office).

County land use regulations do not include any zoning for Cooke City/Silver Gate. Park County, Montana is developing a comprehensive plan which will include the entire county except Cooke City/Silver Gate. Local citizens and the Park County Planning office are exploring zoning options for the area. Currently there are few restrictions on how private land can be developed in this area. If lands are subdivided, the subdivision is subject to a review and approval by the County Commissioners. If a septic system is installed, a permit from the county sanitarian is required. Federally managed lands are exempt from zoning regulations.

Geological Resources

Affected Environment

Most of the study area is classified as having high occurrence potential for one or more types of precious and/or base metal mineral deposits. The entire study area has varying degrees of development potential (Table 3-2, Forecast for Mineral Activityt). The mineral deposits are associated with Cretaceous and Eocene age (38-141 million years ago) igneous intrusions that originated at depth and moved upward through the earth's crust before cooling near the surface. Precious and base metal deposits on public domain federal land in the study area are currently administered as locatable minerals under the General Mining Law of 1872 (1872 Mining Law). Private minerals coming into the public domain through purchase or donation may be administered under the Acquired Lands Leasing Act of 1947.

General Geology

The Beartooth Mountains are a Laramide basement-cored range typical of the Rocky Mountain Foreland (Kulik and Schmidt, 1988). The uplift is a northwest-trending, fault-bounded block, about 75 miles long and 25-40 miles wide (Simons, et al, 1979). Highly resistant Precambrian metamorphic rocks have been uplifted as much as 15,000-20,000 feet against Phanerozoic sedimentary rocks. The mountains rise as much as 5,000 feet above the surrounding land surface.

The proposed withdrawal study area is situated along the juncture of the Beartooth Plateau and Cooke City structural zone. The Beartooth Plateau consists predominantly of Precambrian granite gneiss and unmetamorphosed granite, dated at about 2.7 billion years. The Cooke City zone forms the western limit of the Beartooth Plateau. It is a structural low that trends northwest-southeast. Several Tertiary intrusive centers are aligned along this zone; it may have been a major control on emplacement of Eocene intrusive centers and related mineralization. Within this zone, Paleozoic sedimentary rocks have been preserved; the Precambrian-Cambrian contact dips southwest. Much of the western portion of the zone is covered with Tertiary volcanics (USGS, 1993).

Strata in the area strike generally northwest-southeast, and have southerly to southwesterly dips. Faults and fractures in the area have predominant orientations of northeast, north-northwest, and east-west. Mineralization often occurs along these fractures (Lovering, 1929).

Several intrusive stocks were emplaced during Eocene time. The stocks are interpreted to be the cores of stratovolcanos and consist of felsic calc-alkaline rocks. They are present as stocks, sills, dikes, laccoliths, and other irregularly-shaped bodies. Volcanics associated with the stocks are mainly found in the southwestern portion of the study area.

The land surface has experienced alpine glaciation during the Pleistocene, resulting in the formation of cirques, hanging valleys, glacial lakes and morainal deposits. There has been considerable Holocene deposition, as stream alluvium, talus, and landslide deposits.

Mineral Demand

Gold, copper, and silver are the commodities that are of interest to the mining industry in the Cooke City area at the present time. Other metals may be of interest in the future (Appendix B).

Gold is produced and used on a world-wide basis. Domestic mines continued to produce at near record levels, maintaining the United States' position as the world's second largest gold-producing nation. The importance of gold as a store of wealth, including its role in world monetary systems, is the principal driving force that leads to efforts to find and produce more gold.

Of the total gold available in the world today about one-third is held by national central banks and other official agencies such as the World Bank and the International Monetary Fund as a support for monetary systems. Another third is held in private hoards, as a hedge against inflation and sudden domestic or international instabilities, or for speculation purposes. The other third is in jewelry and in other fabricated uses such as in the electronic industry and dentistry (USGS, 1988).

Since 1980, U.S. consumption of refined copper has ranged from 1.8 to 2.4 million tons. Worldwide consumption reached 10.8 million metric tons in 1991. Electrical uses are the dominant domestic use. Other copper uses are in construction, machinery, and transportation.

Silver is produced by about 120 mines in 18 states. Total domestic mine production in 1994 was an estimated 1,400 tons. World silver production was an estimated 14,000 tons. Photography continued to be the largest single use of fabricated silver, accounting for just over 50 percent of the total demand. Electronics and batteries comprised about another 20 percent. Jewelry, silverware, coins, and miscellaneous other uses account for the remaining demand (U.S. Bureau of Mines, 1995).

Economic Geology

Mineral deposit types in the proposed withdrawal area fall into five distinct categories:

- skarn-replacement
- porphyry copper-molybdenum-gold
- alkaline gabbro-syenite association (magmatic segregation)
- polymetallic veins
- gold placers

Skarn-replacement deposits are produced when mineralizing fluids expelled from igneous intrusions penetrate into limestone, chemically altering the carbonate. Skarns form crescent-shaped zones around the Fisher Mountain and Homestake intrusive complexes (Elliott, et al 1992). Much of the mineralization has occurred within the Meagher limestone. At Fisher Mountain, fractures associated with faulting, permitted migration of fluids to the overlying Pilgrim Limestone. Within the Homestake and Alice E. breccias, carbonate fragments served as hosts for the mineralizing fluids (Elliott, 1992).

Hydrothermal alteration of the limestone is most intense at distances up to 150 feet from its contact with the intrusive. Within this range, the Meagher Formation has been massively replaced by sulfides and iron oxides. Beyond this distance, the replacement zone is thinner, and metal concentrations decrease (Elliott, et al, 1992). At 600 feet from the contact, the limestone is only slightly altered.

The Fisher Mountain and Homestake intrusive complexes are both weakly mineralized copper-molybdenum-gold porphyries. To the north, the Upper Cretaceous Goose Lake stock is also a weakly mineralized copper porphyry. It includes syenite porphyry as well as monzonite, quartz monzonite and intrusive breccia. Copper-gold-platinum group element (PGE) mineralization is interpreted to be a magmatic segregation deposit associated with secondary potassium feldspar near the center of the Goose Lake stock (USGS, 1993).

Few secondary enriched or oxidized zones related to the porphyries have been identified. It is interpreted that much of this epithermal mineralization was removed by glaciation and subsequent erosion.

Mineralized veins may be found as much as 5 kilometers (3 miles) from an intrusive center, independent of host rock (USGS, 1993). Veins more proximal to the intrusions may be enriched in gold-copper minerals, whereas distal veins are probably enriched in lead and zinc. South of Cooke City, lead-zinc-silver mineralization occurs in polymetallic veins as replacement in Cambrian limestones. Mineralization here is about a mile from the nearest stock. Mineral development potential is identified in Map 3-11.

Historical Activity

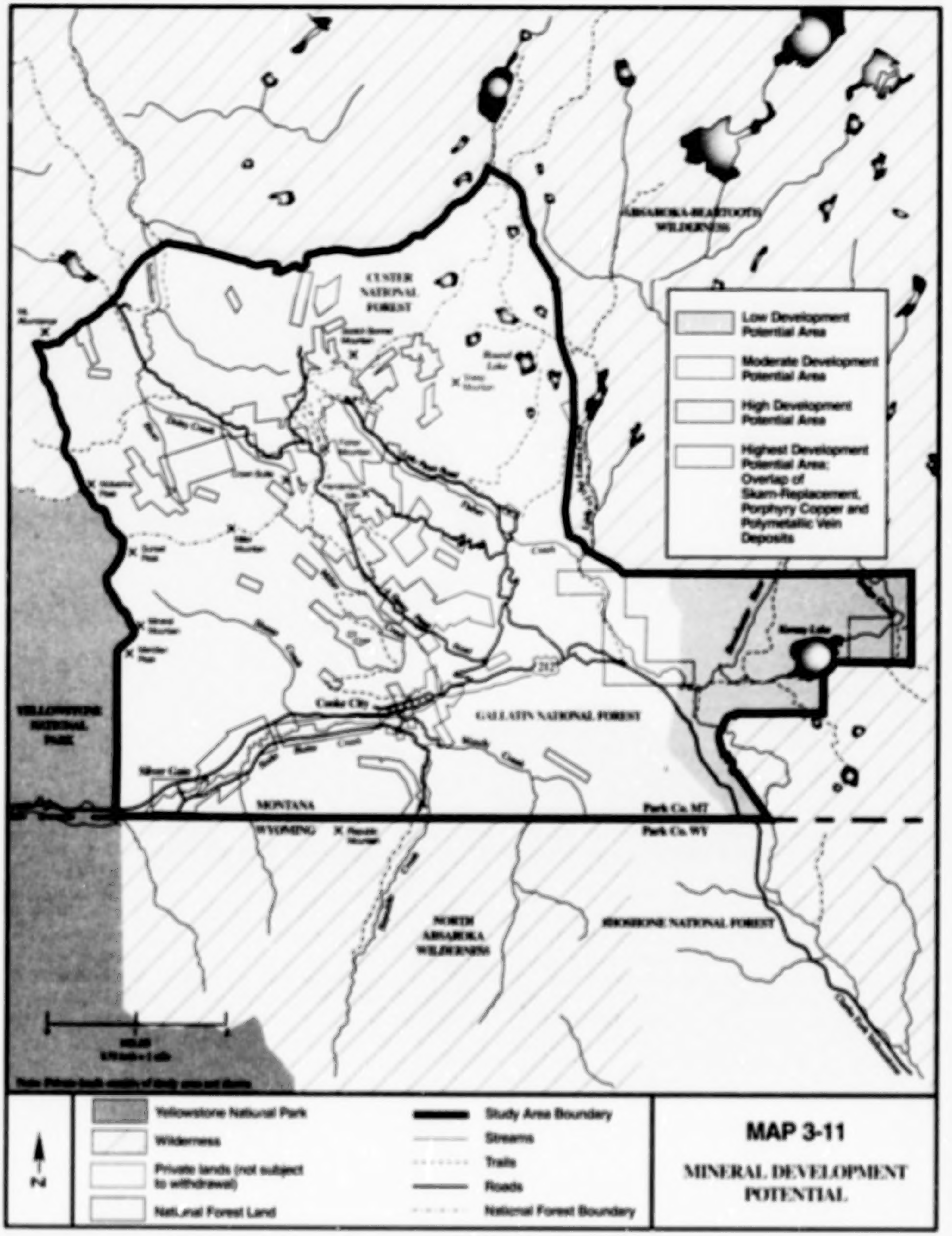
The mineral potential of the area was recognized in 1869, with the first prospectors arriving soon thereafter. Initially, mining occurred in the Republic Mountain area south of Cooke City, along the Montana-Wyoming state line. During the period 1875-1887, small amounts of lead, silver and zinc were produced. The mines continued to operate until the early 1950s.

Between 1888 and 1930, copper-gold ore was mined north of Cooke City, at the Little Daisy, Homestake, Glengarry, and Alice E. mines. The McLaren Gold (open pit) mine commenced operation in 1933, and closed in 1953 when its mill burned. The mine produced a reported 337,000 tons of ore; average grade was 0.184 ounces per ton (opt) gold, 0.26 opt silver and 0.59% copper (Elliott, et al, 1992). Map 3-16, Cultural Resources, identifies the major mines and prospects in the Cooke City area.

The upper Stillwater River and Soda Butte Creek have known gold placers. Three placer claims were patented in 1892.

Mining of copper-rich syenite occurred during the period 1904-07 at the Copper King mine, north of Goose Lake, and just north of the study area. Copper ore was stockpiled, but none shipped. The deposit contains porphyry copper, gold, and PGE.

By the time mining ceased in the late 1950's, over 3,300 acres of claims had been patented. Overall, New World district production to date is a reported 62,311 ounces of gold; 692,386 ounces of silver; 1,963,800 pounds of copper; 3,242,615 pounds of lead; and 920,200 pounds of zinc. Most of the gold and copper came from the McLaren Gold mine (Elliott, 1992; Reed, 1950).


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Round Lake
Daisy Creek
Low Development Potential Area
Moderate Development Potential Area
High Development Potential Area
Highest Development Potential Area: Overlap of Skarn-Replacement, Porphyry Copper and Polymetallic Vein Deposits
YELLOWSTONE NATIONAL PARK
212
Cooke City
GALLATIN NATIONAL FOREST
Silver Gate
Soda Butte Creek
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
Clarks Fork Yellowstone
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary
N

MAP 3-11

MINERAL DEVELOPMENT POTENTIAL

Recent Activity

Exploration resumed in the 1960's, concentrating on the potential for porphyry copper-molybdenum deposits. North of Goose Lake, Bear Creek Mining Company discovered mostly low-grade copper porphyry. During 1962-73 and during the early 1980's in the Fisher Mountain area, several companies identified gold-copper-silver deposits in the Como area. Crown Butte Mines, Inc. explored the Henderson Mountain area beginning in 1987 and discovered several high-grade gold-copper skarn and replacement deposits, including the Miller Creek deposit and the Homestake intrusion breccia, as well as additional surface and subsurface minable deposits at McLaren. Total core drilling by Crown Butte between 1987 and 1992 is 295,375 feet in 824 holes (Elliott, et al. 1992). Total metal content is estimated at 2.6 million ounces of gold, 179 million pounds of copper, and 10 million ounces of silver, in over 12 million tons of ore reserves (Table 3-9 Ore Reserves).

Currently, 265 unpatented lode mining claims are being maintained in the study area. Most are in the area that includes Henderson Mountain and Scotch Bonnet Mountain. It is estimated that the total area of lode claims is about 3,900 acres. Three placer claims encompassing perhaps 65 acres appear to be associated with the intrusions around Henderson Mountain.

There are two lode claims (about 40 acres) in the Republic Mountain area. They are located in proximity to the Irma mines, where lead-zinc-silver mineralization was exploited. Seven lode claims located along the south shore of Goose Lake just north of the withdrawal area. The claims are within the A-B Wilderness area, which has already been withdrawn from mineral entry (the claims predated wilderness designation).

Placer gold has little development potential, but the known production in the upper Stillwater River and Soda Butte Creek drainages may encourage casual (recreational) gold panning.

Geological Hazards

The water chemistry of Fisher Creek has been extensively altered (and to a lesser extent, Daisy Creek, and Soda Butte Creek) by past acid rock drainage (ARD) and/or leaching from mine tailings. The upper portions of this stream have been severely impacted due to oxidation of chalcopyrite (copper-iron sulfide) in the mineralized rock. Though much of the current ARD is due to past mining, a recent study (Furniss, 1996) documented natural weathering of sulfide minerals that resulted in the production of acidic waters. Furniss identified ferricrete deposits (iron carbonate cementation of stream gravels) dating from the last glacial period, perhaps 8,000 years ago. Precipitation that infiltrates through sulfide-bearing rock or tailings could generate additional sulfuric acid that is discharged at springs. There are numerous mass-movement (landslide and slump) deposits in the Cooke City area. Landslides are the result of natural over-steepening of slopes through stream erosion or weathering of the igneous and/or sedimentary rock. It is most common in areas of easily weathered rocks, such as Paleozoic carbonates and Tertiary volcanics. Man-caused slides may occur where road construction or other development destabilizes slopes and/or weathered rock materials.

Mineral exploration, core drilling, near Henderson Mountain.

Faults in the area are not known to be active. There is a history of earthquakes in the area within and surrounding Yellowstone NP. Most of the earthquakes appear to be associated with the Yellowstone 'hot spot', interpreted to be a zone of magma, found at shallow depths.

Other Minerals

Industrial Mineral Deposits. Nonmetallic or industrial mineral resources do not occur in significant amounts within the proposed withdrawal area. Massive Precambrian granitic gneiss is a potential source of building stone. Various limestone units are potential sources of rock for cement. However, equally acceptable or superior sources of these mineral resources are available outside of the study area, where they are more accessible and closer to potential markets.

Sand and gravel deposits may be found in either streambed gravels, landslide deposits or as glacial tills. These potential resources have not been mapped. No active or abandoned pits or quarries are known to occur within the study area.

Clay minerals are known from only one area. The Fire Clay patented mining claim contained a deposit of highly altered monzonite porphyry (Lovering, 1929) that may be suitable for use as a refractory clay.

Oil and Gas. There are no known oil and gas reservoirs within the study area. Paleozoic sedimentary rock exposed at the surface are often reservoirs in other areas, but are presumed to be too shallow, and too fractured to have retained any generated hydrocarbons (Tonnsen, 1982).

Iron and Manganese Bog Deposits. Remobilization and separation of iron and manganese through ground water interaction with soils or marshes can result in local sedimentary accumulations of very high grade iron or manganese oxide minerals in bog deposits. Within the study area, ferricrete deposits are exposed along Fisher and Miller Creeks, and near springs in the vicinity of the old McLaren pit. These deposits consist of clasts of porphyry, limestone and shale, cemented by a finer-grained matrix of goethite. Historically, such deposits have been mined in Europe, but have not been economically important in the United States.

Geothermal Resources. No hot springs are known to occur in the study area. The closest geothermal area is located approximately 20 miles to the southwest, within Yellowstone NP.

Reclamation Potential

Landscape Interpretations for Erosion and Reclamation

The processes influencing soil erosion potential are complex, and depend on climate, soil properties, land slope, vegetation cover, and degree and kind of disturbance. Prediction of project level soil erosion potential is beyond the scope of this analysis. However, for the northern two-thirds of this area, the severity of climate; shallow, weakly weathered soil materials; steep slopes; sparse plant cover; and extreme disturbance potential all infer that soil erosion potential will probably be much higher than that predicted for most parts of the NF. This is exemplified by the McLaren Pit, an open pit mine dating back to the mid 40's and 50's. Though mostly recontoured now, it previously exemplified high erosion rates; barren, acid soils; bedrock exposure, and steep slopes. The Goose Lake mining district, just north of the study area, also has been heavily affected by past activity and remains a physical and chemical pollution source.

TABLE 3-9 GEOLOGIC ORE RESERVES BASED ON CROWN BUTTE MINES INC.
EXPLORATION IN GOLD-COPPER-SILVER DEPOSITS,
NEW WORLD MINING DISTRICT (AS OF APRIL 4, 1992)

Deposit	Tonnage	Gold, opt	Silver, opt	Copper, percent	Gold, ounces	Silver, ounces	Copper, pounds
Como	707,318	0.118	0.546	1.03	77,805	386,195	14,570,750
Fisher Mtn.	334,200	0.189	1.13	0.28	63,164	377,646	1,871,520
McLaren	2,171,035	0.091	0.381	0.70	197,564	827,164	30,394,490
Miller Creek	2,218,368	0.387	1.54	0.87	858,508	3,416,286	38,599,603
Homestake	6,600,966	0.224	0.83	0.71	1,478,616	5,478,801	93,733 717
Total	12,031,887				2,675,657	10,486,092	179,170,080
Average Grade		0.222	0.87	0.75			

Post- and concurrent- mine reclamation success depends on a number of factors. The most important of these are proper reclamation planning, mine operator performance, and use of techniques appropriate to the surrounding environment. Assuming the former two are adequate, the environment has a strong influence on overall reclamation success. The objectives of reclamation include preventing excessive erosion and returning natural native communities to disturbed lands. In addition to establishing ground cover we should attempt to initiate natural succession in a disturbed area so that native communities develop over time.

Reclamation is considered to be "normal" when the environment is amenable to techniques involving reasonable costs, with high probability of success in reducing erosion potential and restoring a relatively natural plant community. Soils have relatively thick topsoil, and are easily stripped and stockpiled for re-spreading. Landscape indicators of "normal" reclamation difficulty include presence of lower subalpine forest, wet soils with riparian vegetation, elevations below 8,000 feet Mean Sea Level (MSL), clayey or medium textured soils, and moderate slopes.

Reclamation is "difficult" when climatic conditions are severe, soils are marginal, and plant communities are fragile and slow growing. Effective reclamation may require area-specific research, or require unusual investment such as plant nurseries on site or specialized seed collection. The rate of ground-cover re-establishment may be too low to prevent erosion on some slopes. Soils have low fertility and may be highly disturbed during the mining process. Topsoil is marginal and is susceptible to mixing with lower, infertile or acidic layers during stripping. Reclamation costs in these environments are much higher than in "normal" situations. Risk of revegetation failure is higher than in other environments, resulting in potential additional costs of "re-reclamation". Landscape indicators are presence of upper subalpine forest and turfs; shallow, coarse or moderately coarse textured soils; potential for acidifying soil materials; shallow, rocky soils; elevations above 8,000 feet MSL.; and steep slopes.

Reclamation difficulty is shown on Map 3-12. Normal reclamation techniques are likely to be adequate for 12,000 acres or 46% of the area. However, reclamation is likely to be "difficult" as defined above in the remainder (14,160 acres or 54%), primarily in the northern part of the area.

Environmental Effects

The direct impacts to geological resources from hardrock mineral development, under all alternatives, are based on the availability of federal and private mineral lands for mineral exploration and development, and are expressed in acreage. A withdrawal of federal minerals would reduce the available acreage.

Additionally, the location of available lands is an important consideration. Some mineral deposits types are found only within particular segments of the study area. For example, skarn-replacement deposits have the highest known likely development potential. Known deposits are concentrated around Henderson Mountain; permissive areas for undiscovered deposits are restricted to the western two-thirds of the area. Polymetallic vein deposits may be found throughout the area, but have lower economic potential; they may contain base metals rather than precious metals, and may be of insufficient tonnage to support a viable mine.

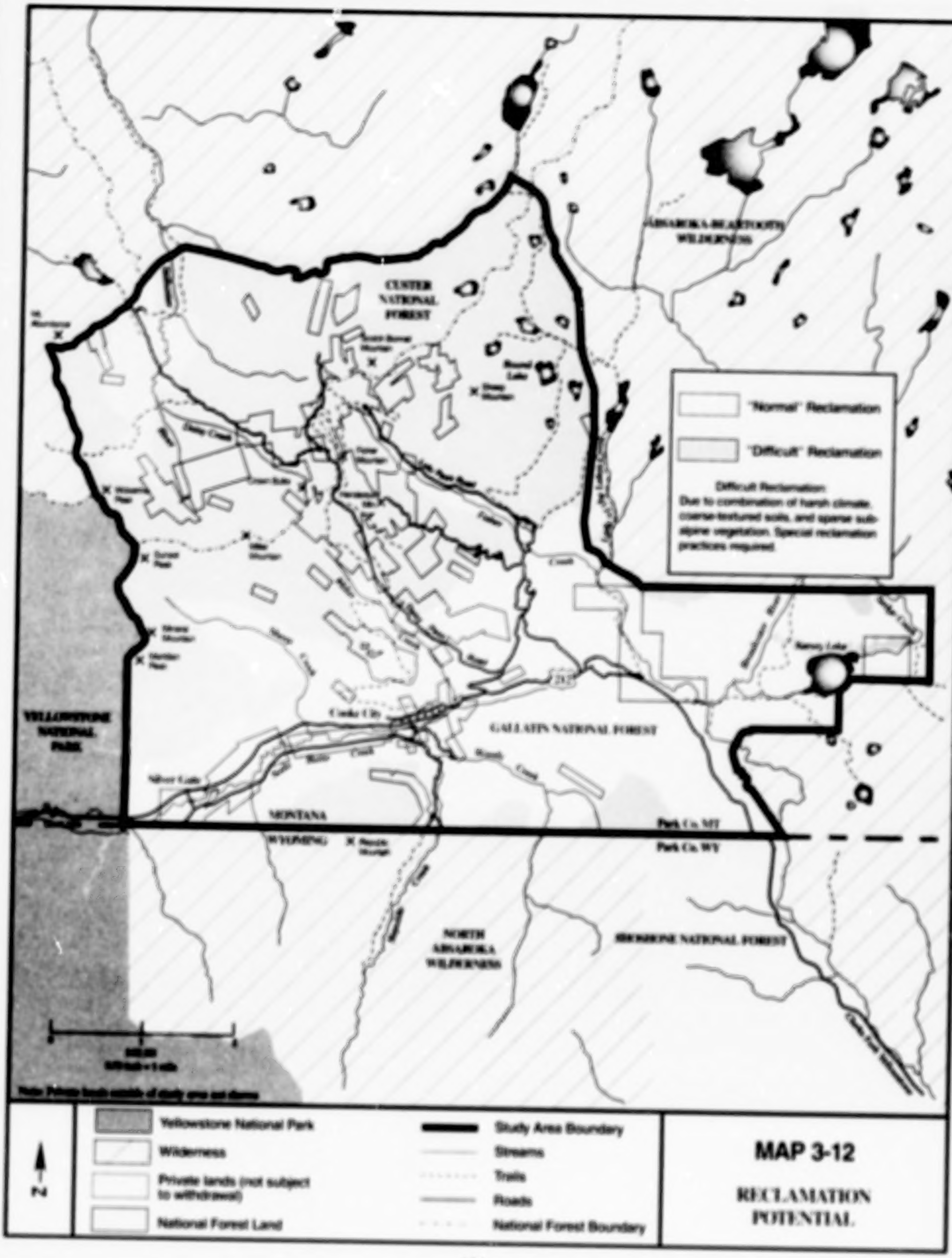
Mineral resources to be affected by the Alternatives and the NWM Agreement have been quantified. Crown Butte's New World Project (NWP) has delineated reserves of precious and base metals in skarn-replacement deposits (Table 3-9). The quantity of undiscovered mineral resources may be estimated by deposit type, using past development and the NWP as analogs (Table 3-9a).

Appendix B is a forecast of future mineral activity in the Cooke City area. This forecast has been tailored to the assumptions for each Alternative. The baseline for impact analysis is the quantity and type of mineral resources produced to date in the New World Mining District (NWMD). It was used to determine the amount and degree of change for each Alternative. The baseline for assessing impacts relating to geologic hazards, most notably acid rock drainage, is the present condition. For geologic hazards, this analysis will attempt to qualify the impacts of the Alternatives.

It is assumed that future exploration and/or development would occur on available lands with the highest development potential for each alternative.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

This Scenario assumes continued exploration and development of the entire study area, encompassing 26,160 acres of federal (22,000 ac.) and private (4,160 ac.) minerals. All potential mineral deposit types could be fully explored for their economic development potential. Exploration in some form would be conducted continuously across the area, with more concentrated activity occurring where higher values of mineralization are found. Reconnaissance-scale activity would result in little surface disturbance. More concentrated exploration drilling (as many as 10 separate operations) would each disturb 4 acres over a 2-3 year period.


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Round Lake
"Normal" Reclamation
"Difficult" Reclamation
Difficult Reclamation
Due to combination of harsh climate, coarse-textured soils, and sparse sub-alpine vegetation. Special reclamation practices required.
Cooke City
212
GALLATIN NATIONAL FOREST
YELLOWSTONE NATIONAL PARK
Silver Gate
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
Note: Private lands outside of study area not shown
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary
N

MAP 3-12

RECLAMATION POTENTIAL

TABLE 3-9a. EFFECTS ON LOCATABLE MINERALS

MEASUREMENT	Alternative A: No Mineral Withdrawal		Alternative B: Proposed Mineral Withdrawal	
	Scenario A-1 NWM Agreement Not Implemented	**Scenario A-2 NWM Agreement Implemented**	**Scenario B-1 NWM Agreement Not Implemented**	**Scenario B-2 NWM Areement Implemented**
Mineral Acres Available	26,160	20,240	8,400	2,480
Available Deposit Types with Development Potential	All	• Skarns • Magmatic Segregation • Polymetallic veins	• Polymetallics • Gold-rich copper skarns • Porphyry copper	• Skarns • Polymetallic veins near Republic Mtn and Goose Lake
Mineral Acres Unavailable	0	5,980	17,760	23,680
Development Forecast				
Mines	2 Underground 1 Surface	1 Underground 0 Surface	2 Underground 1 Surface	No mines
Relative Probability of Development (See Appendix B)	• 1st underground mine: > 1:10 • 2nd underground mine: > 1:50 • Surface mine: 1:10	• Underground mine: < 1:50	• 1st underground mine: 1:10 • 2nd underground mine: < 1:50 • Surface mine: < 1:10	
Exploration Activity	10 Operations	5 Operations	7 Operations	1 Operation
Location of Activity	Mostly private land	Mostly federal land	Mostly private land	Private land
Total Acres Disturbed	495-620	75-200	495-620	4
Potential Ore Production Deposit Types	20 Million tons from gold-rich copper skarn	8 Million tons from skarns/polymetallic veins	20 Million tons from gold-rich copper skarn	0 Tons; exploration of polymetallic veins
Potential Metal Production, New World Mine Project	Au: 2.3 MM oz. Ag: 8.8 MM oz. Cu: 132 MM lb.	No production	Au: 2.3 MM oz. Ag: 8.8 MM oz. Cu: 132 MM lb.	No production
Speculative Metal Production	Au: 2.6 MM oz. Ag: 10.0 MM oz. Cu: 179 MM lb	Au: 2.3 MM oz. Ag: 8.8 MM oz. Cu: 132 MM lb.	Au: 2.6 MM oz. Ag: 10.0 MM oz. Cu: 179 MM lb	No Production

It is forecast that development would focus on the gold-bearing copper skarns in the Henderson Mountain area. A moderate-sized underground mine, Crown Butte's New World prospect, would be developed. This operation would disturb about 180 acres over its 12-22 year mine life (NWP PDEIS, Chap 3.4). Up to 11 million tons of ore would be produced, yielding 2.3 million oz. of gold, 8.8 million oz. of silver and 132 million pounds of copper.

Crown Butte has also delineated surface-minable resources in the McLaren and Como area. These prospects (or a similar deposit) are forecast to be developed. It would disturb 200-400 acres over an 8-15 year mine life, and yield as much as 275,000 oz. of gold, 1,213,000 oz. of silver, and 45 million pounds of copper.

Additional exploration could lead to the discovery of a second underground mine prospect. This prospect has not yet been delineated, and thus has a lower probability of development. It is forecast to disturb 75-200 acres over an 8-15 year mine life. Its reserves are forecast to be similar to the New World prospect.

Projected mineral resources developed from any one of the three forecast mines would be orders of magnitude greater than the total gold, silver and copper produced to date in the New World Mining District. Assuming all three mines were developed, the study area would produce approximately 200,000 ounces of gold annually over a 20 year period. To put this in perspective, Montana's largest gold producer, the Zortman-Landusky mine, averages about 100,000 ounces of gold per year.

The amount and degree of change from baseline conditions as a result of mining under this Alternative is significant. Exploration and mining activities would be continuous for the foreseeable future, with the majority of activity occurring on private land. Due to the lead time needed to explore a prospect and obtain approval for its development, none of the three forecast mines, if developed, would be in full production at the same time.

The risks of acid rock drainage caused by exposing hazardous geologic materials, most notably sulfide-bearing rock, could increase substantially. Earthmoving and blasting could increase the potential for landslides and snow avalanches. Mine structures and engineered landforms, such as tailings impoundments and waste rock dumps, run the risk of failure in the steep terrain and alpine climate. Impacts associated with geologic hazards are potentially adverse and significant. Identification of potential hazards and appropriate mitigation would be handled most appropriately as design alternatives at the mine permitting stage (NWP PDEIS Chap 3.4).

Scenario A-1 represents the maximum development forecast for the study area. This Scenario would have a significant beneficial effect on the long-term mineral productivity of the New World Mining district. Additionally, exploration and development of this geologic terrain in its high alpine environment could lead to important scientific and economic understanding of its geology, as well as development of innovative mineral extraction and reclamation techniques which might be utilized throughout the industry.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

If the NWM Agreement is implemented, mineral land available for mining would total 20,240 acres. Crown Butte currently maintains or leases about 4,180 acres of mining claims, and owns or leases 1,740 acres of patented claims. Under the agreement, the federal government would acquire, or otherwise make unavailable for mining, Crown Butte's mineral holdings.

The Agreement would result in a 5,920 acre (23%) decrease in the total land available for mining in the study area. The area with known mineral reserves having the highest development potential (Map 3-11) would be unavailable for mining. Non-Crown Butte patented claims (private land) around Henderson Mountain, though available, might not have sufficient reserves to support mining independent of adjacent federal lands being available for entry. Mining activity would focus on areas of high development potential, located in the western and southwestern portions of the study area. The majority of the activity would occur on federal land.

Reconnaissance-scale exploration is forecast to continue, but at a substantially lower level than without the NWM Agreement. Five exploration drilling programs could each disturb 4 acres and last 2-3 years, a 50% decrease from Scenario A-1.

Only one underground mine is forecast to open in the area where the skarn-replacement deposit type overlaps polymetallic mineralization. This mine would have a lower probability of development than either underground mine forecast in Scenario A-1, since the highest potential land would be unavailable for development. This mine is forecast to disturb 75-200 acres over an 8-15 year mine life. The mine could yield as much as 2.3 million oz. of gold, 132 million pounds of copper, and 8.8 million oz. of silver, from over 8 million tons of ore reserves (Table 3-8).

Potential mining under this Scenario represents a substantial increase in total production to date in the NWMD.

Projected mineral resources to be developed from the underground mine, if developed, would be orders of magnitude greater than the total gold, silver, and copper produced to date in this mining district. Overall NWMD production to date is a reported 62,311 ounces of gold; 692,386 ounces of silver; 1,963,800 pounds of copper; 3,242,615 pounds of lead; and 920,000 pounds of zinc (Elliott, 1992; Reed, 1950).

The risks of acid rock drainage caused by exposing hazardous geologic materials, most notably sulfide-bearing rock, could increase substantially. Earthmoving and blasting could increase the potential for landslides and snow avalanches. Mine structures and engineered landforms, such as tailings impoundments and waste rock dumps, run the risk of failure in this steep terrain and alpine climate.

The amount and degree of change from baseline conditions as a result of mining under this Alternative could be significant if an underground mine would be developed. Production from an underground mine could represent a substantial increase in overall mineral production in the NWMD. Nonetheless, implementation of the NWM Agreement would cause a long-term adverse impact on mineral exploration and development in the area. Fewer exploration operations than those forecast under Scenario A-1 would occur in the Henderson Mountain area, resulting in no mining activity for the foreseeable future in an area with substantial known ore reserves. Identified mineral resources unavailable for mining under this alternative have been estimated as 2.6 million ounces of gold, 179 million pounds of copper, and 10 million ounces of silver, in over 12 million tons of ore reserves (Table 3-9).

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this Scenario, all federal lands would be withdrawn from entry. Only private land and presently claimed federal land with valid existing rights (VER) would remain open to mining. The withdrawal would eliminate at least 17,760 acres of federal minerals (68%) from mineral location for a 20 year period.

Available private land and federal land (subject to VER) would be concentrated in the Henderson Mountain area, and total no more than 8,400 acres. All of the available mineral land is considered to have the highest development potential in the study area (Map 3-11).

Exploration in some form would be conducted continuously in the Henderson Mountain area. Reconnaissance-scale activity would result in little surface disturbance. More concentrated exploration drilling (as many as 7 separate operations) would each disturb 4 acres and last 2-3 years.

The three mines forecast for Scenario A-1 are forecast under this alternative as well (Table 3-8). Mining would occur almost entirely on private land. Relative to Scenario A-1, the probability of any of the three mines occurring would be diminished due to limited federal land being available for exploration and mining infrastructure.

All direct, indirect, and cumulative impacts from this alternative would be the same as described for Scenario A-1. Long term productivity of the NWMD may be adversely affected since exploration for unknown mineral deposits would be prohibited on the unavailable lands.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this Scenario, the locatable mineral resources would be withdrawn from entry. Areas with high development potential would not be available for exploration to determine if precious metal reserves are present. This would adversely affect short-term and possibly long-term potential mineral production in the study area. Changes in mineral economics may or may not allow for development of these resources if the withdrawal is revoked after 20 years.

This Scenario is the most restrictive to mineral exploration and development. All federal minerals would be withdrawn for at least 20 years. Crown Butte's patented and unpatented claims would be acquired by the federal government and unavailable for mining. A total of 23,680 acres or 90% of the total mineral land (both federal and private) in the study area would be unavailable. Of the land remaining available for mineral activity, 60 acres are unpatented mining claims subject to VER, and 2,420 acres are patented claims and other private land.

It is forecast that exploration would focus on polymetallic veins in the Republic Mountain area, south of Cooke City, or veins and porphyry deposits near Goose Lake, six miles north of Cooke City. Intermittent reconnaissance-scale exploration and one surface-disturbing exploration program is expected. It is unlikely that exploration would result in development of a mine.

The amount and degree of change from baseline conditions and the cumulative impacts (combined past, present and reasonably foreseeable future mineral activity) resulting from the realization of the NWM Agreement under this alternative would be adverse and significant in terms of lost opportunity. Ore bodies that would not be developed due to the withdrawal and NWM Agreement might not be economically recoverable in the future due to economic or social trends, and/or governmental action.

The combination of a mineral withdrawal and implementation of the NWM Agreement would adversely affect the short-term and long-term productivity of the NWMD. This alternative would preclude opportunities to discover and delineate mineral deposits throughout the study area. It could also preclude mining, for the foreseeable future, in an area containing substantial known ore reserves. This represents a significant adverse impact to the present use of this area for mineral resource development. Only low potential land would be available in the short-term.

Private Lands and Unpatented Mining Claims

Affected Environment

A mineral withdrawal does not effect mineral development on private land or federal land with unpatented mining claims subject to valid existing rights. However, the withdrawal may affect future mineral development on private land and unpatented mining claims because surrounding federal lands are no longer available for mining facilities such as millsites and tailings impoundments. Such effects are speculative and would depend upon the size, type and location of a future mine.

There are 4,160 acres of private land within the study area. With the exception of 794 acres of land that were patented under the Homestead Act, and 49 acres for Cooke Townsite, the private land consists of "patented" mining claims. With the discovery of a valuable mineral deposit, a claimant may obtain legal title (patent) to the surface and mineral rights on the claims. Patented mining claims are concentrated on Henderson Mountain, and along Soda Butte Creek, Fisher Creek, and Miller Creek (see Map 3-13) .

Currently, there are 476 unpatented mining claims in the study area. Unpatented mining claims are an area of public land held under the General Mining Law of 1872 on which the U.S. still holds title to the lands but the right of exclusive possession is given to the locator of a valuable mineral deposit. The general location of unpatented mining claims is shown on Map 3-13.

There are three types of unpatented mining claims: lode, placer, and millsites. There are 265 lode mining claims located in the withdrawal area. Lode claims are staked on veins or lodes of quartz or other rock in place bearing gold, silver, or other valuable deposits. Lode claims are located primarily in the Henderson Mountain and Scotch Bonnet Mountain area. Three placer claims, encompassing 65 acres, are located in the lower Fisher Creek drainage. Placer claims are staked on deposits other than quartz or other rock in place, for example, alluvial gravels associated with rivers and streams. Placer gold has little development potential, but the known production in the upper Stillwater River and Soda Butte Creek drainages may encourage casual (recreational) gold panning.

There are 202 millsite claims primarily located in the Fisher Creek drainage. Millsite claims are 5 acres of non-mineral land used for mineral processing and waste rock disposal.

To establish valid existing rights to a mining claim, a mining claimant must show that he/she had made a discovery of a valuable mineral deposit on the claim and maintained the discovery to the present. To establish valid existing rights to a millsite claim, the millsite must be non-mineral in character and a mining claimant must show use or occupancy of a site for mining or milling purposes.

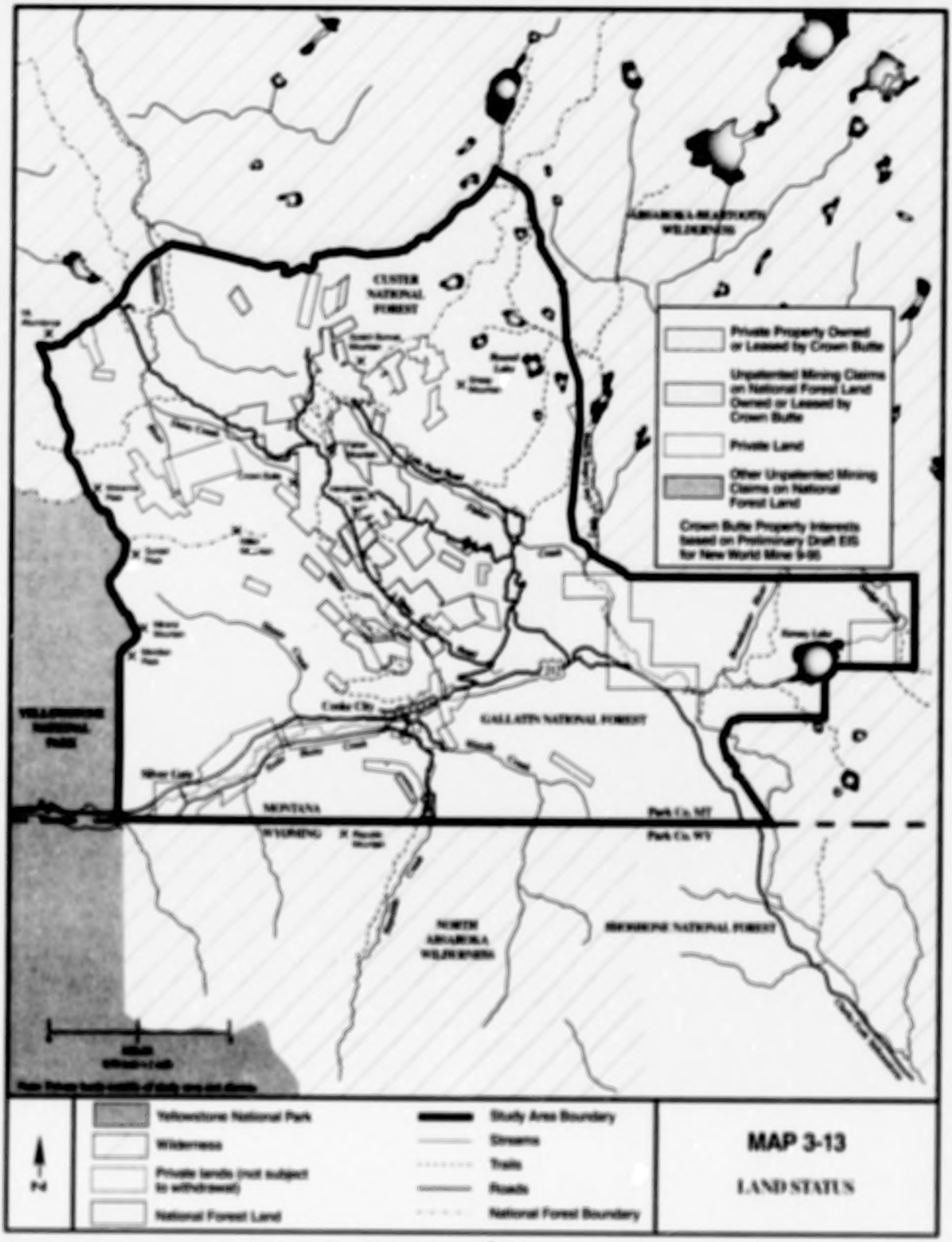
Crown Butte Mines Inc. (Crown Butte) is the holder or lessee of 466 of the unpatented claims. The two non-Crown Butte lode claims (about 40 acres) in the Republic Mountain area were probably located for lead-zinc-silver mineralization.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

As federal land remains available for filing of mining claims, mineral development that may occur on private land or unpatented mining claims is not affected by lack of available federal land for facilities. Current land management continues with all federal land in the area available for mineral entry with the exception of approximately 500 acres currently withdrawn around federal recreation and


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Private Property Owned or Leased by Crown Butte
Unpatented Mining Claims on National Forest Land Owned or Leased by Crown Butte
Private Land
Other Unpatented Mining Claims on National Forest Land
Crown Butte Property Interests based on Preliminary Draft EIS for New World Mine 9-95
Cooke City
GALLATIN NATIONAL FOREST
YELLOWSTONE NATIONAL PARK
Silver Gate
MONTANA
WYOMING
Park Co. MT
Park Co. WY
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary

MAP 3-13

LAND STATUS

administrative sites. Facility siting options are not restricted due to a mineral withdrawal, therefore there may be more options available to mitigate potential adverse effects to area resources.

New World Project. All alternatives under consideration in the NWP PDEIS remain viable, and additional alternatives could be developed on federal land available for mineral entry.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

If the NWM Agreement is implemented, approximately 17,760 acres of federal land would remain available for filing of new mining claims (Map 2-2). Future mineral development on these lands as well as on private lands outside the NWM Agreement area could proceed without being affected by a lack of available lands for facilities. However, the mineral development of private land interspersed with Crown Buttes property interests could be affected by the NWM Agreement. Up to 1,700 acres of private minerals and 4,180 acres of unpatented mining claims in the central portion of the study area would not be available for mining-related uses (Map 3-13). As the NWM Agreement does not include all the private land in this area, mineral development of the remaining lands could be affected. The potential affect depends upon the size and location of any future mine.

Property interests acquired under the NWM Agreement would not be withdrawn under this Scenario. For purposes of this analysis, the assumption is that the U.S. Government would take necessary actions to protect the investment made to acquire these properties. Congressional action, future NEPA analysis associated with land exchanges or purchases, or restrictions on the deed such as a conservation easement are alternatives to withdrawal of acquired lands from mineral entry. Filing of mining claims on highly mineralized areas and millsite claims for potential facility sites would be likely without a withdrawal.

If a withdrawal was not implemented for acquired properties, unpatented mining claims relinquished by Crown Butte would reopen to filing of new mining claims. Private property acquired from Crown Butte could be available for mineral leasing or for filing of mining claims under the 1872 Mining Law depending upon how they are acquired. In general, lands purchased by or donated to the United States are not available for mineral entry under the 1872 Mining Law. However, mineral leasing may be authorized by the Forest Supervisor. If private lands are acquired through exchange, the acquired lands take on the status of federal lands that were exchanged. For example, if federal lands available for mineral entry are exchanged for private lands, the acquired private lands are also available for mineral entry.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

The immediate effect of a mineral withdrawal is to withhold from future mining 17,760 acres of unclaimed federal land. A withdrawal decision would not affect a claimant's right to hold and maintain valid, existing unpatented mining claims within the study area. Unpatented claims require annual payment of a claim maintenance fee to retain rights associated with the mining claim. If annual filings are performed and there is a discovery of valuable minerals as described under the mining laws, the withdrawal would not affect these rights. However, if either of these conditions are not maintained, rights associated with the unpatented claims would revert to the federal government and the land and minerals would be subject to the terms and conditions of the mineral withdrawal. If an unpatented claim is relinquished, the claim area is then subject to the withdrawal. The mineral withdrawal does not prevent the sale of unpatented mining claims. The rights associated with an unpatented mining claim can be transferred to another party regardless of a mineral withdrawal.

Mineral development could proceed on private land and unpatented mining claims subject to the normal permitting process. The proposed mineral withdrawal could affect future development of private land and unpatented mining claims. Mineral development on private land may depend on adjacent federal land for part of the operation. Without a specific proposal to evaluate, the specific effects of the withdrawal on mineral development on private land is difficult to quantify. However, the recently proposed New World Project serves as an example of the relationship between development of private land and the adjacent NF in this area. Development of the New World Project potentially required the use of adjacent federal land ranging from 113 acres under the off-site tailing disposal alternative to 264 acres under the Lulu Pass/Fisher Creek mill site alternative. Ore processing, tailing impoundments, work camps, access roads, utilities, and ventilation shafts are examples of facilities that may be necessary on surrounding lands.

Comments on the Draft EIS expressed concerns that the withdrawal represents a "takings" of private property due to diminished development options and subsequent loss of property value. The Fifth Amendment of the Constitution prohibits the taking of private property without just compensation. The withdrawal does not apply to private land, nor does it affect rights associated with unpatented mining claims. The withdrawal is not a regulation that directly effects the use or value of private property. Ownership of private land does not convey any rights to use of adjacent federal lands. Therefore, the withdrawal does not constitute a takings.

The mineral withdrawal could affect future development of private land and unpatented mining claims. Any such effects are highly speculative and site specific. There is no evidence that a mineral withdrawal will reduce property values in the area.

The lack of available federal land for facilities could result in environmentally less preferable development on private land.

New World Project. The mine can be developed on private land and unpatented mining claims controlled by Crown Butte. The proposed withdrawal would potentially effect some facility siting options for the New World Project including tailings impoundments and work camps. Three alternatives have either the impoundment or mill proposed outside Crown Butte's claim boundary - the Modified Proposal (pyritic tailings impoundment), the Lulu Pass/Daisy Creek Mill Site Alternative (one impoundment, portion of mill), and the Lulu Pass/Fisher Creek Mill Site Alternative (one impoundment). These areas would be unavailable for facility development if a mineral withdrawal is implemented (Map 3-14).

The proposed withdrawal may preclude the development of other options as well. For example, additional facility options in the Stillwater River drainage and the Kersey Lake area would not be available. Restricting lands available for facilities may result in less environmentally preferred development on available lands.

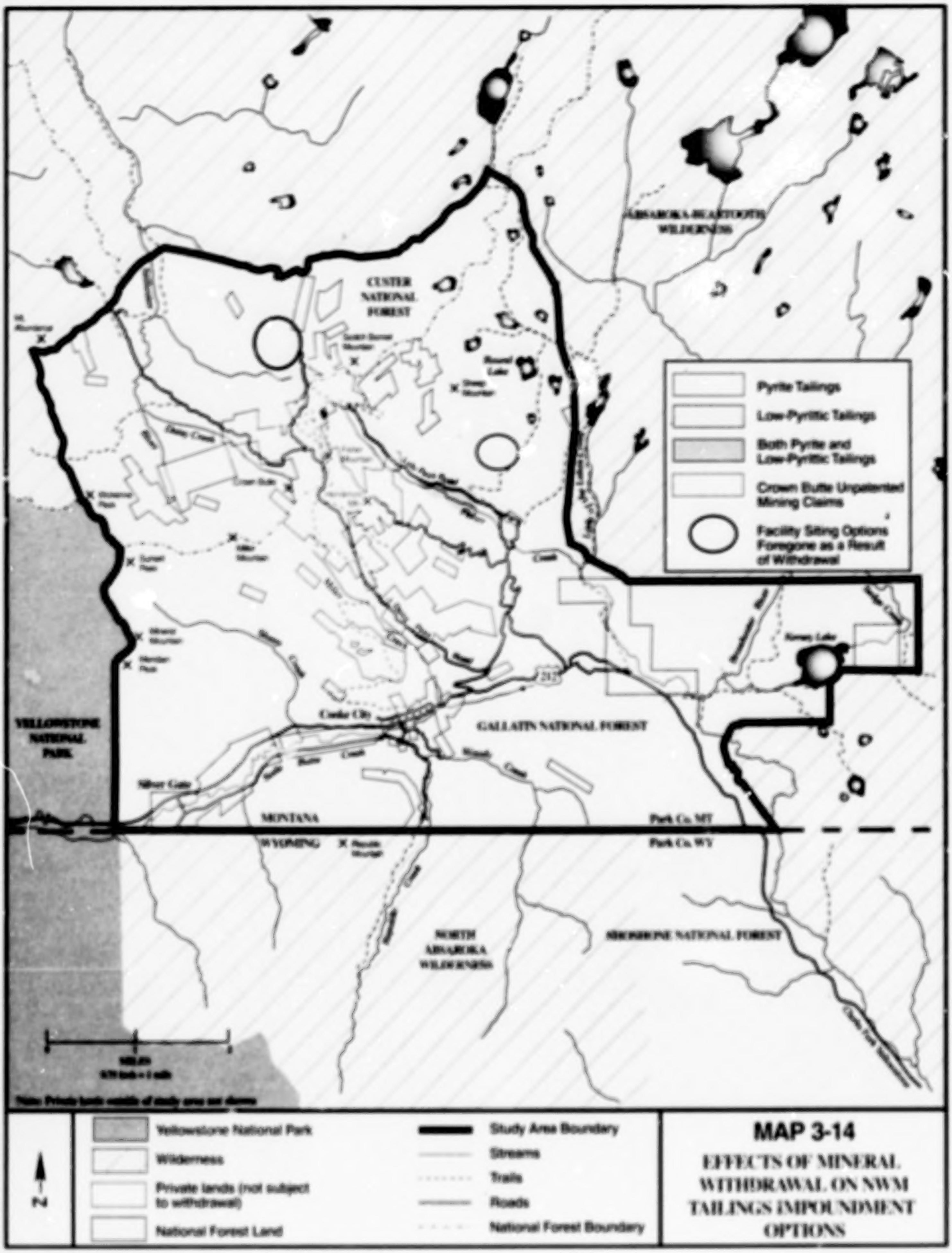
Crown Butte could still use all federal lands with valid mine or millsite claims owned or leased by Crown Butte for mine facilities. Five alternatives could proceed on these claims and on private land owned or controlled by Crown Butte, or on off-site tailing disposal sites on public (BLM managed) land in Wyoming or Montana.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal and up to 1740 acres of Crown Butte's private minerals and 4,180 acres unpatented mining claims are withdrawn when the NWM Agreement is implemented. 60 acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development. The mineral forecast, assumes no mines would be developed and one exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

The NWM Agreement combined with the mineral withdrawal closes over 99% of federal land to mineral entry. Up to 1,700 acres of private minerals with high development potential would be acquired by the U.S. The ability to develop a mine on the remaining private land could be affected by the lack of available sites for mining facilities. The actual effects would depend upon the location and size of a future mine. A small-scale mine may be developed where materials are hauled off-site. Refer to Scenario B-1 for a more detailed discussion of potential effects to remaining private land and unpatented mining claims not acquired under the NWM Agreement.

Under the NWM Agreement, Crown Butte would relinquish the 466 unpatented mining claims they currently hold in the proposed withdrawal area. When these claims are relinquished by Crown Butte, the land occupied by the claims would be subject to the withdrawal. When Crown Buttes property interests are acquired by the United States, the acquired lands or minerals are subject to the withdrawal.


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
GALLATIN NATIONAL FOREST
YELLOWSTONE NATIONAL PARK
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
Cooke City
Silver Gate
Kersey Lake
Crown Butte
MONTANA
WYOMING
Park Co. MT
Park Co. WY
212
Pyrite Tailings
Low-Pyritic Tailings
Both Pyrite and Low-Pyritic Tailings
Crown Butte Unpatented Mining Claims
Facility Siting Options Foregone as a Result of Withdrawal
MILES
Note: Private lands outside of study area not shown
N
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary

MAP 3-14

EFFECTS OF MINERAL WITHDRAWAL ON NWM TAILINGS IMPOUNDMENT OPTIONS

Forest Plan Consistency

Affected Environment

Forest Service management of federal lands within the study area is directed by the Gallatin and Custer National Forests' Forest Plans. Forest Plans are required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) as amended by the National Forest Management Act of 1976 (NFMA). They provide guidance for all natural resource management activities on National Forest System lands. Plans establish goals and objectives for the multiple use of renewable resources, and standards and guidelines to assure sustained productivity of the land and protection of the environment. In short, goals and objectives identify the types of goods and services to be provided while standards and guidelines set the environmental sideboards within which activities are to be carried out.

Forest Plan direction is established at two scales, forestwide management direction which is applicable throughout the Forest, and management area direction which ties specific goals, objectives, and standards to the unique capabilities of given parcels of land.

Gallatin Forest Plan: Forestwide Direction

Forestwide direction for the Gallatin NF can be found in Chapter II of the Forest Plan. The goals and objectives identified here reflect the types of goods and services to be provided, on aggregate, from the forest as a whole. It is not intended that all goals and objectives be pursued on every acre or within each watershed on the Gallatin NF.

Among the 21 forestwide goals is one which states, "Provide for orderly and environmentally acceptable exploration and development of minerals, oil and gas, and geothermal resources" (FP, pg. II-1). This goal is complimented in the section describing forestwide objectives with a statement that "existing and future rights to prospect, develop, and mine on federal lands available for mineral entry will be recognized in implementation of this Forest Plan" (FP, pg. II-5). Hardrock mining is regulated by the 1872 Mining Law and State and Federal regulations. Reasonable access and the right to operate on valid mining claims is guaranteed under the mining laws. Since the Gallatin NF has potential for hardrock minerals, the Forest Plan direction described above was provided to accommodate this potential use.

The Cooke City area, is one (1) of eight (8) areas on the Gallatin NF recognized in the Forest Plan as having a high potential for active mineral extraction, processing and exploratory operations. Withdrawal of this one area would therefore not lead to a need to amend the forestwide goals and objectives for minerals.

Forestwide standards are designed to limit the magnitude and scope of activities in order to maintain and protect certain conditions of the land. Since mineral withdrawal does not result in the implementation of any ground disturbing activity, compliance with any of these standards would not be a problem. The Forest Plan does contain a standard (FP, pg. II-25), and a set of criteria in Appendix D (FP, pg. d-3,4) for evaluating existing and future mineral withdrawals.

The statement in the DEIS that the evaluation criteria contained in Appendix D of the Gallatin Forest Plan are only applicable to smaller withdrawals is based on the context provided in the introductory paragraph of this section where it states:

> "On the Gallatin National Forest certain specific areas have been withdrawn from mineral entry. These areas may be current administrative sites, land for expansion of current administrative sites, ski areas, campgrounds, picnic areas, lookouts, ranger stations, and some specific recreation areas such as mineral springs" (Gallatin Forest Plan, pg. D-3).

The Custer Forest Plan (Appendix IV) contains similar wording.

In addition, since the Forest Service does not have the authority to withdraw lands from mineral entry, the criteria provided in the Forest Plans would be applicable only to the extent of determining whether the agency should "initiate" or "request" a withdrawal action (Gallatin Forest Plan, pg. D-4 and Custer Forest Plan, pg. 165). Since the Cooke City Area Mineral Withdrawal was proposed by the Department of Interior at the request of the President, the "initiation" or "request" of withdrawal action becomes a moot point. The evaluation criteria contained in the Forest Plans is binding only on the Forest Service and is not applicable to withdrawal proposals initiated by the President and/or the Secretary of Interior.

In spite of the legal applicability, information is provided throughout the Cooke City Area Mineral Withdrawal EIS which addresses these criteria. For example: A discussion of existing laws and regulations is included in Chapter 2. Chapter 3 identifies pertinent laws and regulations applicable to mining proposals which are designed to protect the environment. The resource values of the area and potential risks are described in the Affected Environment sections of Chapter 3. The mineral potential of the area is discussed under Appendix B. In summary, information relative to the Forest Plan criteria is presented throughout the EIS and will be considered in making a decision about the proposed mineral withdrawal.

Gallatin Forest Plan: Management Area Direction

Areas within the Gallatin NF that have had active or recently active mineral extraction, processing and/or exploratory operations were assigned a management area prescription of MA 24, which provides for the exploration and development of mineral resources. The Henderson Mountain area, near Cooke City, includes 1,439 acres within this prescription (see Map 3-15). While MA 24 management direction does not mandate that mining activity occur, it would be inconsistent with the intent of a mineral withdrawal. Therefore, if these lands are withdrawn from mineral entry, as described in Alternative B, it would be appropriate to also amend the Gallatin Forest Plan to change management area (MA) 24 to match the management area prescription of surrounding lands, MA 15. This management area provides for dispersed recreation use while emphasizing management and recovery of the grizzly bear. Refer to the Gallatin Forest Plan, pages III-47 to III-49, for the goals, objectives and standards that would be applied to this area.

Custer Forest Plan - Forestwide Direction

Forestwide direction for the Custer NF can be found in Chapter II of the Forest Plan. The Custer Forest Plan describes goals in a manner similar to the Gallatin Forest Plan (Custer NF, 1986). The goal for minerals management is to be responsive to the national demand for energy and strategic minerals. The goals for the wildlife and fisheries resources include managing and improving key habitats, enhancing habitat quality and diversity, and providing wildlife or fish-oriented recreation opportunities. The goal for threatened and endangered species is to provide habitat that contributes to species recovery. Like the Gallatin NF's plan, the Custer NF's plan establishes a goal of meeting State water quality standards.

Custer NF's objectives summarize how the various resources and activities will be managed under the Forest Plan. The objective for minerals development will be consistent with other resource values and management area goals. Objectives for other resources, such as soil, water, timber, and cultural resources are also described in the Forest Plan.

The Forest Plan does contain a standard (FP, pg. II-35) and a set of criteria in Appendix IV (FP, pg. 165) for evaluating existing and future mineral withdrawals. Refer to the discussion above and under the Gallatin Forest Plan: Forestwide Direction. However, these criteria are only applicable to smaller withdrawals such as those recommended as a means to protect campgrounds, picnic areas, and other administrative sites.

Custer Forest Plan - Management Area Direction

The Custer NF within the study area is allocated to Management Area C. This area provides important habitat for grizzly bear and other wildlife. The goal is to manage these wildlife habitats for the optimum quality and diversity that the land can offer. Other resource activities will be modified to maintain or improve the existing habitat.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, no federal lands would be withdrawn and there would be no amendments to the Custer or Gallatin Forest Plans. Potential resumption of the New World Project permitting process would not be inconsistent with the Gallatin Forest Plan.

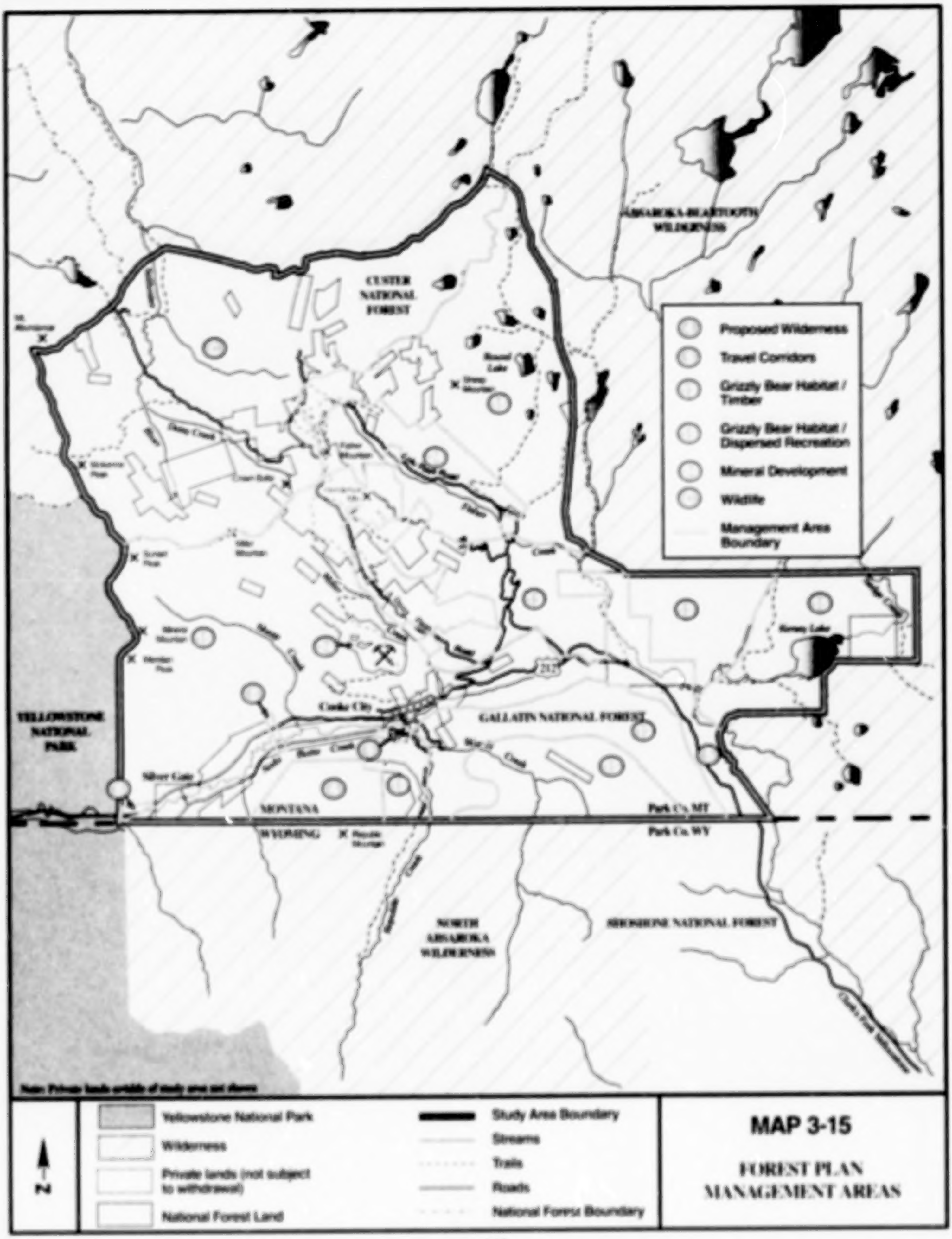
Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, no federal lands would be withdrawn at this time and there would be no amendments to the Custer and Gallatin Forest Plans as a result of this analysis. Property interests including private minerals and unpatented mining claims acquired under the NWM Agreement may be withdrawn at a later date. Any amendments necessary for management of acquired lands would be completed at a later date.

Effects of Alternative B: Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

The National Forest Management Act (NFMA) requires that the Forest Supervisor determine whether a proposed amendment would result in a significant change in the Forest Plan (36 CFR 219.10(f)). Amendments to the Gallatin Forest Plan are proposed under alternative B as an appropriate associated action with a mineral withdrawal. The amendment would change management area MA 24, minerals emphasis, to MA 15, grizzly bear/dispersed recreation emphasis, for those lands that are subject to the withdrawal.

Under this Scenario, the permitting process for the New World Project would likely resume. The current MA 24 prescription corresponds closely with the area that would be developed for the proposed New World Project. However, if the Gallatin Forest Plan has been amended to change MA 24 to MA 15, then the resumption of the New World



MAP 3-15

FOREST PLAN MANAGEMENT AREAS

Project permitting process would be inconsistent with the new goals and objectives for the area. While MA 15 does not preclude mineral development, it also does not recognize it as a dominant use. Therefore, the Gallatin Forest Plan would need to be amended to change this area back to MA 24 prior to or in conjunction with a decision to approve the New World Project or other mines.

Management area direction on the Custer NF is consistent with the proposed mineral withdrawal. Appendix IV, Mineral Withdrawal, Custer Forest Plan, and Appendix D, Minerals Management Gallatin Forest Plan, would be amended to include the mineral withdrawal.

If the forest plan is amended as proposed under this alternative, the result would be no effect beyond what would already be affected by the proposed withdrawal action. The amendments would change current direction to reflect that these lands are no longer available for mining. They do not change management emphasis or the level of goods and services to be provided for any other National Forest resource. Both MA 15 and MA 24, on the Gallatin NF and MA C on the Custer NF, in conjunction with forestwide direction, are consistent in the goals, objectives, standards and guidelines that would be applied to the Cooke City area, excepting mineral exploration and development.

Outputs and activities projected through implementation of the Gallatin Forest Plan are found on page II-8 of the Plan. This table shows that for minerals management, the Gallatin Forest projected a workload of approximately 125 to 200 cases per year. The Custer Forest Plan did not project locatable minerals workload. The Forest Service has no jurisdiction over subsurface resources and therefore Forest Plan goals and objectives do not lead to targets in terms of production (e.g. tons of ore, ounces of gold, etc.) The level of minerals management activity is also projected in anticipation of outside applications. The Forest Service does not promote or solicit for mineral exploration and development.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

The effects would be similar to those described above under Scenario B-1 with the following exceptions. Under this Scenario, private land may be acquired, primarily on the Gallatin National Forest. Any private land acquired would assume the management area of the surrounding lands. In this case, acquired private lands would be allocated to Management Area 15, grizzly bear/dispersed recreation emphasis. Private land acquired on the Custer NF portion of the study area would be allocated to Management Area C, grizzly bear, wildlife emphasis.

ECONOMICS

Substantive Changes Between the Draft EIS and Final EIS

Under Environmental Effects, Alternative Scenario A-1, a sentence was added indicating indirect employment could be as high as 320 jobs during construction and 180 jobs during operations.

Under Environmental Effects, Alternative Scenarios A-1 and B-1, estimates of the costs and labor needed to build power lines from Cody to Cooke City were updated.

Under Environmental Effects, Alternative Scenarios A-2 and B-2, estimates of the potential employment associated with mine cleanup were added.

Introduction

This section describes the economic community in and around the New World Mining District and the Cooke City/Silver Gate area of south-central Montana and northwestern Wyoming. A technical background report "Social and Economic Technical Report - New World Project" (7/13/96) serves as a detailed technical background document describing the existing economic environment and potential economic impacts associated with the New World Project. The technical report will be frequently referenced and will be included in the project file for this EIS.

The economic issues identified during the scoping process include:

- Effects on employment - how would a mineral withdrawal in the New World Mining District affect the future employment/unemployment situation in the region?
- Effects on Income - would the proposed action have adverse effects on the income of a region that already has a per capita income substantially below the national average?
- Economic Structure - would economic resiliency, stability, diversity and dependency be affected by the exclusion of mining and further emphasis on recreation and tourism?
- Effects on Government Finances - how would mining affect government costs and revenues?

Affected Environment

The economic analysis focuses on Park County, MT which is the location of the proposed mineral withdrawal, and Park County, WY which is the potential location of (1) any additional power lines carrying electricity to future millsites in the New World District, (2) the primary transportation corridor for potential future ore hauling, and (3) permanent residences of mine workers.

The economic effects on Cooke City and Silver Gate, MT are emphasized because they are located in the middle of the study area. Other affected communities include Gardiner and Livingston in Park County, MT, and Cody, and Powell in Park County, WY. Livingston, Cody and Powell are the only incorporated cities in the economic analysis area. Some economic effects would extend beyond Park County, MT and Park County, WY, to cities like Billings, MT; but the significance of mining activities on those economies would be less because the economies of those communities are notably larger.

Billings, a city of over 80,000 people is about 125 miles from Cooke City. It could be a source of labor, materials, and supplies; but the effects on its economy would be negligible. The Red Lodge, MT, economy would be affected very little because U.S. 212 over Beartooth Pass is closed for seven months each year because of snow.

Industry Profile

Park County, Montana. Industry in Park County, MT features many small service and retail trade businesses supported by tourism and recreation due largely to its proximity to Yellowstone NP and the location of Livingston on Interstate 90. The largest economic sectors (in terms of earnings) in 1993 were services (28.1 percent), retail trade (15.9 percent) and government, (13 percent).

Mining comprised only 4 percent of the earned income of the economy. Health services was the largest component of the Services sector (35.4 percent), while hotels and lodging comprised 22.0 percent of the Services sector. This is more than four times the state percentage rate for that industry. The eating and drinking establishments industry is the largest component of the retail sector (34 percent) - a rate half again larger than the State of Montana.

Transfer payments (pensions, welfare etc.) accounted for 24.0 percent of total personal income in 1993 compared to 19.8 percent in 1983 (BEA 1995). The rate for the State of Montana is presently around 20 percent.

Industry in the Cooke City/Silver Gate area consists of service and retail trade establishments serving the tourists to Yellowstone NP in the summer, hunters in the fall, and snowmobilers and skiers in the winter. Specific businesses include motels and cabins, restaurants and bars, service stations, general stores, outfitters and guides, and gift/souvenir shops. Not all of these are open year round. A survey of businesses in the Cooke City/Silver Gate area, conducted by Crown Butte in 1990, indicated that employment levels in Cooke City/Silver Gate varied from about 75 full-time and part-time persons in the summer to 20 to 30 persons during the winter. The vast majority of business revenue accrues during the summer.

The Corkran survey (1993) indicated that tourists and outdoor recreationists are the largest sources of Cooke City area business revenues. Tourists, the largest single group of customers, consist of travelers who stop in Cooke City or Silver Gate on their way to and from Yellowstone NP. They may buy gas, food, gifts or even stay a night or two, but their use of the local economy is based on its proximity to Yellowstone NP. Tourists account for about 31 percent of total business revenue. Outdoor recreationists (with 39 percent of total business revenue) may venture into Yellowstone NP, but Corkran states that Cooke City/Silver Gate and the surrounding wildernesses are the primary destinations for these persons. See Table 3-10 for a complete economic sector profile of Park County, MT.

Park County, Wyoming. Cody is the county seat and a major center for tourism in northwestern Wyoming. Cody is the nearest major community to the east entrance to Yellowstone NP. Tourists entering or leaving Yellowstone NP from the east entrance travel through Cody. The only incorporated communities in Park County, WY are Cody and Powell.

The economic sectors with most earnings in 1993 were government (23 percent), services (18.5 percent), mining, oil and gas (14.5 percent), and retail trade (11.8 percent). Although mining accounts for approximately 15 percent of the economy, most of this is from the oil and gas industry.

The largest industry in the Services sector is health services (27.8 percent) with hotels and lodging places second at (22.0 percent). This is more than twice the state rate for the hotels and lodging places industry. The eating and drinking industry is about 25.1 percent of the retail sector which is approximately the same as the state percentage.

Transfer payments in 1993 were 15.9 percent of total income - slightly above the Wyoming state average but substantially below Park County, MT (BEA 1995). Table 3-10 presents a complete economic sector profile for 1993 for Park County.

TABLE 3-10: ECONOMIC STRUCTURE PROFILE (% BY EARNED INCOME - 1993)

Sector	Park Co., Montana	Park Co., Wyoming	Montana State	Wyoming State
Farming	7	7	9	5
Mining	4	15	3	17
Construction	6	9	6	7
Manufacturing	9	5	8	5
Trans, Public Util.	10	4	9	9
Wholesale Trade	4	4	5	3
Retail Trade	16	12	12	10
Finance, Ins & Real Estate	3	3	5	4
Services	28	18	24	17
Government	13	23	20	23
TOTAL	100	100	100	100

Bureau of Economic Analysis 1996

Employment and Income

Affected Environment

Park County, Montana. The Park County, MT, labor force has seen constant increases since 1990. The recent unemployment rate has varied from a low of 4 percent in 1994 to a high of 7.8 percent in 1985. Total employment has remained fairly constant or increased slightly on an annual basis since 1980; however, the makeup or distribution of the types of jobs has changed.

The importance of tourism is exemplified by the increase in the number of service and retail trade jobs without major increases in the traditional basic industrial sectors. Since 1980, the number of service and retail trade jobs has more than doubled.

The 1992 per capita income in Park County, MT was $14,076. Since 1980, total earnings have increased significantly in the services, retail, and government sectors. However, total earnings have declined in basic industrial sectors such as transportation and manufacturing.

In 1994, average annual wages of workers were $15,706. Though scarce, the highest paying jobs were mining jobs where wages were more than double the average of other workers in the county. The lowest paying jobs were associated with the services and trade sectors.

Non-earned income (*i.e.*, retirement income, transfer payments, and investment income) is an increasingly important source of income, especially in the Cooke City area. Corkran (1993), found that 66 percent of Cooke City households with seasonal residents have no employment or business ownership ties to the local economy.

Park County, Wyoming. The civilian labor force remained relatively stable from 1990 to 1993, with a 6 percent increase from 1993 to 1994. In 1986, the unemployment rate peaked at 9.4 percent. Since 1986, the unemployment rate has declined to a low of 4.2 percent in 1991 with a 1994 rate of 4.5 percent. This decline is primarily due to job growth in the recreation/tourism economy, which has outpaced growth in the labor force. Since 1986, the unemployment rate has been consistently lower than the state average. Since 1987, total employment has increased almost 15 percent due to growth in services, retail trade, and government. The mineral industry (mostly oil and gas), lost 322 jobs between 1970 and 1986, and then remained relatively stable until 1992 when 174 more mining jobs were lost.

Since 1980, total earnings have increased at an annual average rate of about 5 percent. In 1993, average annual wages for workers were $19,213, about 11 percent less than the average wages of all workers in Wyoming. The highest paying jobs are in the mining and federal government sectors while the lowest paying were in retail trade and services.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

The Forecast for Mineral Activity, which was developed as one possible Scenario for analysis purposes (Table 3-2), assumes the New World Project would be developed. It also assumes other mines of similar size could occur, but would be much less likely. In addition, up to 10 mineral exploration operations may occur.

It is likely that employment and income in the region would be directly affected by the mining activity projected above. Activity in mining also creates indirect employment opportunities when the mining firms and their employees spend money for goods and services.

Each exploratory drilling operation would employ up to 10 seasonal workers and would be in operation for a 2 to 3 year period.

Using the NWP as an example, anticipated peak employment from mining would be about 320 in the second year of operation. Direct employment would tend to stabilize by the third year after initiation until project completion (8 to 15 years). It is estimated that mine operations following the construction phase would employ about 180 workers. After mining operations cease, direct employment during closure and reclamation would drop to about 10 people. Operations with off-site tailings disposal would have slightly higher employment. If other mines are developed, employment increases would depend on the size of the mine.

Based on an analysis of the NWP, average income (wages) per new mine worker would be about $37,000 per year. These wages would be consistent with existing mining and construction wages in the area. Mining would be among the highest paying jobs in the two-county area.

Total peak direct annual income for the NWP would be about $8.5 million dollars the second year of the project, with total direct annual income during operations of about $6.5 million starting in the third year of the project. Income would increase if additional mines were developed.

Indirect employment would be created when mining firms purchase goods and services to be used in their production or when miners purchase personal goods and services. Peak indirect employment from NWP development is estimated to be about 150 persons in the second year of a project. Following the construction phase and during mine operation phase, mining activities would create indirect employment for about 90 workers in the various economic sectors throughout the impact area. However, an analysis based on the MicroImplan economic impact model estimated indirect employment as high as 320 jobs during construction and 180 jobs during operations (Beckley Project file). Indirect employment would also increase if other mines were developed.

Much of the worker's wages would be spent locally, and would generate indirect employment and income. Analysis of the NWP anticipated that indirect income would peak at approximately $1.7 million in year 2 when development is at its peak and level off at $1.0 million during operations. Total income spent locally beginning in the fourth year of the project would be about $4.7 million.

Any operations with off-site tailings disposal would generate slightly more income. Cody, WY would have the largest share of total project-related construction and operations income. Except for Cooke City and Silver Gate, MT, the projected increase in income would be a small portion compared with current income levels.

Based on analysis of the NWP, it is anticipated that less than 20 miners would become permanent residents in the Cooke City/Silver Gate area, about 200 would live in Wyoming, and 100 would live elsewhere in Montana. The communities that would probably have the largest number of mine employees would be Cody, WY (about 40 percent), Livingston, MT (about 10 percent), Powell, WY (about 10 percent), and Billings, MT (about 10 percent). The employment effect would be most noticeable in the Cooke City/Silver Gate area where almost 20 highly paid workers would change the economic character of the community. (Currently there are only about 20 to 30 employees during the winter and about 80 during the summer.) Mine employees would constitute a relatively small proportion of employment in the other communities.

It is reasonable to expect that mining would cause a slight increase in per capita income for both Park County, MT and Park County, WY. However, this change would be nondetectible in the statistics because of many other unrelated effects on income throughout the economic region.

At the end of mining operations, employment and consequently, income, would be scaled back as mining ceases and final reclamation begins. Total income would gradually adjust to a level that would have occurred without mining projects. Once potential projects close, income and personal spending would decline to what it would have been without the project. Service industries would adjust to the reduced level of spending by scaling back employment and output. The project would constitute a relatively small proportion of income in all residency areas except Cooke City/Silver Gate, MT, and the adjustment to loss of project income would be most severe in Cooke City/Silver Gate unless the project proponent and county planning mechanisms provide plans for a smooth transition.

Distribution of indirect employment and income would be similar to that of direct employment and income. Here too, the impacts would be most noticeable in the Cooke City/ Silver Gate area where almost 20 new employees (miners) would also create additional jobs and income in other economic sectors.

The effects of new mining employees and their families residing in the area would create more spending which itself creates income and employment in the local retail and service industries. Other factors such as year round access to the Cooke City/Silver Gate area would also result in increased spending.

A mining operation could experience temporary shutdowns or employment cutbacks during project life. If so, unemployed workers might wait for a reopening or look for other employment. The length of time unemployed workers are willing to wait for work is influenced by the availability and terms of unemployment or severance pay, other job opportunities, and the ties to a community. At the end of mining operations, employment and consequently income would be scaled back. Former employees would retire, find other employment in the area, or seek employment elsewhere. Unemployment costs would increase in the short term while they are unemployed.

Temporary project shutdowns or reductions-in-force would have repercussions for other local businesses. Service businesses may lay off employees or curtail services if spending in the area were to decline. Noticeable economic and social stresses within the Cooke City/Silver Gate area would occur during transition periods involving rehiring of direct and indirect employees and/or hiring of new employees to replace those who may have left the area after being laid off.

Other actions that would cumulatively affect employment and income include mine reclamation, powerline construction, plowing Highway 212 east of Cooke City, highway construction, recreation use, and residential development.

It was estimated that it would cost approximately $8 million to build the necessary power line from Cody to Cooke City (Miller 1996). An estimate of labor and income generated by powerline construction was made using the MicroIMPLAN economic impact model. Approximately $1,300,000 in direct wages and 70 jobs would be created along with another $1.5 million in wages and 100 jobs from indirect spending in the two county impact area (Beckley Project file). However, this would probably last for less than a year. Also only one 69 kV powerline would be constructed between Cody and a substation near Cooke City.

Recreation use of the Greater Yellowstone Area is predicted to increase regardless of mining activity in the New World Mining District. However, this rate of growth could be affected by the presence of mining in the vicinity. Mining-related changes to the economy, mining-related traffic, and increased access to Cooke City/Silver Gate would add to changes caused by highway reconstruction and other factors, all of which would affect recreation related employment and spending in the Cooke City area. It is possible that some businesses in the two-county area, especially those in Cooke City, would suffer short-term losses in recreation/tourism revenue due to the overlapping effects of the highway construction with mining development. However, the specific income (up to $9 million) effects of mining related activities would be small relative to the overall cumulative future economic environment in the two-county area.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Analysis of this scenario assumes only one mine with a low probability and five exploration operations.

The biggest difference between this Scenario and the Scenario A-1 is that the New World Project would not be developed and a surface mine would not be developed. However, mining could still occur on the remaining federal and private land that would be available for mining. If so, this could generate employment and income effects for one mine similar to those described in Scenario A-1.

The NWM Agreement requires substantial reclamation of past mining impacts in the New World Mining District. The cost of this rehabilitation has been estimated to be approximately $22.5 million. Until more information is available about the reclamation, it is difficult to predict how much employment and income could be created.

The employment and income effects associated with powerline construction that were predicted for Scenario A-1 would also apply here if a mine is developed. Other mine reclamation, highway construction, recreation use, and residential development would also cause increased employment and income. The amount and extent of these increases is unknown. Mine reclamation resulting from the NWM agreement would invest approximately $22.5 million in cleanup. This could potentially generate over 230 direct and 250 indirect jobs spread over the life of the project (Beckley Project file).

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this Scenario, the Forecast for Mineral Activity assumes the New World Project is a reasonably foreseeable action (Table 3-2). In addition, another underground mine and a surface mine are much less likely, but they could occur. Up to seven mineral exploration operations are analyzed.

The effects on employment and income would be similar to those described for Scenario A-1.

Other actions that would cumulatively effect employment and income include mine reclamation, powerline construction, plowing Highway 212 east of Cooke City, highway construction, recreation use, and residential development. Except for powerline construction, the amount and extent of most of these increases are unknown.

Employment and income effects associated with powerline construction would be similar to those described for Scenario A-1 (70 direct jobs would be created and 100 jobs from indirect spending, $1,300,000 in direct wages and $1.5 million in wages from indirect spending.)

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this Scenario, the Forecast for Mineral Activity (Table 3-2), assumes no mines would be developed and one exploration operation is possible.

Employment and income generated by mining would not occur. The economy would continue to grow as a result of predicted growth in the tourism industry. An exploratory drilling operation would employ up to 10 seasonal workers and would be in operation for a 2 to 3 year period.

Highway construction, recreation use, and residential development would cause increased employment and income. The amount and extent of these increases are also unknown. Employment effects from mine reclamation would be the same as those described for Alternative Scenario A-2.

Economic Resiliency

Affected Environment

Resiliency—the ability to successfully deal with the inevitable, multiple social and economic changes is an important indicator of a community's health and vitality (UCRB DEIS). Harris and others (1995) conclude that resiliency is relative to population size, economic strength and diversity, attractiveness and surrounding amenities, strong leadership, and other factors such as community residents' ability to work together and be proactive toward change.

Economic Diversity

Economic diversity is considered an important component of economic resiliency. Scoping identified the concern about the loss of diversity in the local economy if the study area was withdrawn from potential mining activities.

There is normally a good correlation between the size of an economy and the amount of economic diversity, i.e., usually the larger the economy the more diverse it is. Another indicator of economic diversity is the total number of economic sectors in the economy, i.e., the more sectors an economy has the more diverse it is. Park County, MT, has 123 economic sectors and Park County, WY has 134 sectors (MicroIMPLAN). When the economies of these two counties are combined as a unit they have a total of 157 sectors. By comparison, Yellowstone County, MT's largest economy, has 207 economic sectors.

The Shannon-Weaver Diversity Index (Alward 1995), also measures economic diversity. This index has increased for every year for which the index was calculated (1977, 1982, 1985, 1990) in both Park County, MT and Park County, WY. This indicates that the economy has become more diverse over the years despite growth and subsequent decline in the minerals extraction industry. Park County, MT shows the sixth highest index out of the 56 counties in Montana. The counties with higher indices have substantially greater populations and larger economies. Park County, WY ranks 8th out of the 23 counties in Wyoming and is also well above the state mean index.

Dependency

Economic dependency (a condition where one or a few industries dominate the economy of a region) is closely related to economic diversity. Scoping comments indicated a concern that the economies in the two county impact area were overly dependent on recreation and tourism. Analysis of economic data validates the claim that the area's tourism economy is substantial. However, the claim that its relative size is causing the economy to lose resiliency has no scientific support.

Economic Stability

Rapidly fluctuating economic variables are generally not desirable. Such variables include seasonal unemployment rate variation, sporadic population growth rate, and fluctuating income growth rates. These fluctuations cause high social costs, complicate government planning, and disrupt local quality of life. This fluctuation also creates a higher rate of in-migration and out-migration that has its associated social costs.

Park County, MT, has shown significant fluctuations in unemployment rates compared to other MT counties (Beckley, 1995). However, it has had relatively stable population growth and higher than average per capita personal income growth in recent years.

Another concern was that regional economic stability could be influenced by the proposed mineral withdrawal. There is no evidence that the mining industry has created stable economic conditions in any region over an extended period of time. However, in the short term, an area may enjoy economic prosperity. For example, Jefferson County, which is located north of Park County, MT, now has the highest per capita income in Montana largely due to the Golden Sunlight gold mining operation.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this Scenario, changes in economic resiliency would be caused by mining operations that would include likely development of the NWP and, although less likely, two other mines. Ten exploration operations are also analyzed.

Changes in economic resiliency would be affected by changes in economic diversity and dependency.

Economic Diversity. Mining activity would increase employment and the number of linked industries that supply goods and services to the mining industries. As the mining industry expands, so would the population, along with the economy and the number of economic sectors. Decreases in other types of economic activity, especially those associated with recreation and tourism, would be localized and relatively insignificant compared to total area development.

In summary, mining would increase the size of the economy, the number of economic sectors, and the Shannon-Weaver diversity index for both counties. All of these measures indicate that mining would increase the economic diversity in the two-county area.

Dependency. Since the mining sector in Park County, MT is insignificant compared to other sectors of the economy, any likely increase in the mining sector would not increase dependency enough to affect economic resiliency. Although the mining sector in Park County, WY, currently accounts for 15 percent of earned income, this activity is from the oil and gas industry, not hard rock mineral mining. Since these are separate industries, an increase in the hard rock mining would not add to any degree of dependency.

The degree of dependency on the recreation/tourism industry would not be affected by mining. With or without mining, the tourism industry is projected to continue to grow. Except for the changes in winter recreation and tourism use that would be anticipated if US Highway 212 is open in the winter, the absolute size of the tourism industry would change little as a result of mining.

Economic Stability. Year-round mining and access to Cooke City, MT from Cody, WY would probably decrease some of the seasonal variation that is present in the local economies. This high fluctuation is primarily a result of the seasonal tourist industry.

The influx of new workers and their families would create a short growth surge in the county populations, especially in the Cooke City/ Silver Gate area. The population would decrease when the construction phase is completed. However, the present growth rate of the two counties would likely obscure the effects of mining.

The per capita income growth rate would increase because of mining/construction wages that would be significantly higher than the local average. However, any changes to the total economy resulting from mining would be obscured and unmeasurable because of the size of the economies.

These mining projects could affect existing business patterns and the recreation/tourism economy. The sources for these effects would arise from the increased population, increased year-round access to the Cooke City/Silver Gate area, and potential conflict with businesses and/or their customers involved in recreation and tourism activities. Some recreational visitors could be displaced and some businesses could have to adjust to mining-related changes in the local economy. The ultimate magnitude of effects would depend on the number and size of mines operating at one time.

Other actions that would cumulatively effect economic resiliency include mine reclamation, powerline construction, plowing Highway 212, highway construction, recreation use, and residential development.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Analysis of this Scenario is based on the assumption that only one mine would be developed and five exploratory operations would occur on federal lands. However, mine development is much less likely than with Scenario A-1.

There would be less potential for effects on economic resiliency similar to those described for Scenario A-1. Other actions that would cumulatively effect economic resiliency include mine reclamation, powerline construction, plowing Highway 212, highway construction, recreation use, and residential development. The amount and extent of these effects are also unknown.

Effects of Alternative B, Mineral Withdrawal, Scenario B-1: New World Mine Agreement Not Implemented

Under this Scenario, development of the New World Project is anticipated and development of additional mines is possible. Seven exploratory drilling operations are also analyzed.

Development of one or more mines could lead to effects similar to those described for Scenario A-1. Other actions that would cumulatively effect economic resiliency would include mine reclamation, powerline construction, plowing Highway 212, highway construction, recreation use, and residential development.

In the long term, the amount of *diversity* resulting from mining would be less likely than with Scenario A-1 because under this Scenario opportunities for mining expansion would be more limited. In the long term, it is also more likely that tourism would continue to become a larger component of the area's economy and residents of the area would become more *dependent* on tourism spending. Short-term *stability*, as it relates to intra-annual employment fluctuation, would still likely be an economic feature in the area.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under this Scenario, the only mining activity would be exploratory operations resulting in little change in economic resiliency. The economy would continue to grow as a result of predicted growth in the tourism industry but probably at a slower rate than it would have if mining had occurred. The economy would also be less resilient than if mining had occurred.

Economic growth, which could be accelerated by mining, would not occur. This would reduce the rate of *diversity* development in the local economy. *Dependency* on the recreation and tourism industry would continue to grow. Short term economic stability, as it relates to intra-annual employment fluctuation, would continue to be a problem without the creation of new year-round jobs in the mining industry.

Mine reclamation, highway construction, recreation use, and residential development would also affect economic resiliency. The amount and extent of these effects are unknown.

Government Finances

Affected Environment

Park County, Montana

Government entities within Park County, MT that could be affected by project development include the county, school districts, special districts, and City of Livingston. Since Cooke City, Silver Gate, and Gardiner are unincorporated, funds for services and infrastructure are generally provided for in the County budget.

County Government. Total taxable valuation has grown steadily in Park County since fiscal year (FY) 1987-1988, reaching $25.6 million in FY 1994. The major component of the tax base in Park County is land and improvements (residential, commercial, and industrial). The major revenue source to Park County is property taxes, which generally accounts for about 50 percent of the general fund.

City of Livingston. Taxable valuation has risen consistently over the past three fiscal years. Revenues were about $1.67 million in FY 1994, while budgeted expenditures were about $1.65 million.

School Districts. *Potentially affected school district jurisdictions include the Cooke City, Gardiner, Gardiner High School, Livingston, and Livingston High School districts. Generally, mill levies for these districts have risen in recent years to fund increasing budget requirements.*

Because of its small size and limited infrastructure and resources, the Cooke City school would be the most vulnerable to growth. The Cooke City Elementary school resumed classes in 1989, after being closed for several years due to low enrollment. Elementary grades (K-8) are taught by one teacher at the school. Enrollment has ranged from 5 to 19 students between 1989 and 1994. The vast majority of the budget for Cooke City School District is spent as general fund money. Of the total general fund money budgeted, about 70 percent has been for the teachers's salary in recent years.

Special Districts

Within the Cooke City area, there is a water district and a rural fire district. The water district sold revenue bonds to move the water source to the Soda Butte Creek drainage and install a storage tank.

The fire district includes both Cooke City and Silver Gate. The annual budget requirement was about $13,000, of which about $8,500 was from current property tax revenue.

Park County, Wyoming

Governmental entities within Park County, WY that could be affected by project development include the county, school districts, special districts, and the cities of Cody and Powell. Since the Sunlight Basin/Crandall area is unincorporated, funds for services and infrastructure are generally provided for in the County budget.

County Government. FY 1994 taxable valuation of the county was $273.1 million, down about 19 percent from FY 1993. About 60 percent of valuation is from mineral production, primarily oil and gas. Property taxes are the most important component of total revenues needed to fund county government, accounting for about $3.3 million of county fund revenue in 1994. The remaining non-property tax revenues come from sources such as interest earnings, payments in lieu of tax revenues, forest revenues, state gasoline tax, severance taxes, motor vehicle taxes, and county sales tax. As the county has grown, expenditures have decreased slightly from 1993 to 1995. The county budget was about $10 million in FY 1995.

City of Cody. Property taxes are a relatively minor source of revenue to the city. The city has an approximate taxable value of $34.8 million and a 5.006 mill levy for 1994. The majority of revenues to Cody come from state sources (transfers) including cigarette taxes, gasoline taxes, sales taxes, mineral royalties, and severance taxes. The total FY 1994 budget (for all funds) was about $10.3 million, of which about 80 percent was for salaries and other current expenses.

City of Powell. Assessed valuation in FY 1994 was about $11.7 million with a millage of 5.000. Property taxes are a relatively minor part of revenues, accounting for about $58,000 in FY 1994. The total FY 1994 budget (for all funds) was about $7.41 million, of which about 65 percent was for salaries and other current expenditures.

School Districts. In FY 1994, the taxable valuation for Cody School District No. 6 totaled $145.1 million or about 50 percent of the total valuation of the county. Taxable valuation was down 4 percent from FY 1993. In FY 1994, property tax revenues from county and operating mill levy accounted for about 45 percent of all general fund revenues. State revenue sources accounted for about 54 percent of general fund revenues. General fund expenditures for Cody School District No. 6 totaled about $11.4 million in FY 1994.

The FY 1994 taxable valuation for Powell School District No. 1 was $73.4 million, down 3 percent from FY 1993. Revenues for the general fund in FY 1994 totaled $10 million, with county and operating levies providing about 34 percent of the total. State sources provide the majority of general fund revenues (about 66 percent). General fund expenditures were about $9 million in FY 1994.

Special Districts. Special districts include the Cody and Powell fire districts and the West Park Hospital District in Cody. The Cody fire district in FY 1994 had property tax revenues of $436,093. The Powell fire district had a FY 1994 assessed valuation of $77 million, a 3 mill levy, and property tax revenues of $230,341. The West Park Hospital District had a FY 1994 assessed valuation of $191 million, 5.491 mill levy, and property tax revenues of $1,050,790.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Analysis of this Scenario is based on the anticipated development of the New World Project, the less likely develop-

ment of two other mines, and ten exploratory drilling operations.

Mining would have short-term effects on the budgets due to the anticipated increase in population and the demand for local services. Park County, MT, and Park County School Districts would experience budget shortfalls during initial project years. These shortfalls could be mitigated through terms of a Mining Impact Plan. A summary of the Hard-Rock Mining Impact Act for Montana is included in Appendix G of this report.

In Wyoming, Park County and Park County School Districts would experience budget shortfalls that could remain until after mining ceases unless a voluntary Impact Plan could be negotiated to mitigate budget impacts.

The single largest governmental revenue source from mining would be property tax assessments from affected Montana jurisdictions. The NWP is used as an example to provide a general idea of the possible anticipated effects of a mine operation (Table 3-11). The direct taxable value of a mine would increase during construction and peak with full production (in this case the fourth year of the project). Total taxable value would then decrease slowly as the value of the project facilities depreciate. Jurisdictions in Montana also would receive property tax receipts from the value of the ore produced (gross proceeds taxable valuation) and the assessed value of any new homes and businesses indirectly associated with project development.

Other sources of local government revenues (e.g., sales and use taxes, user fees, intergovernmental transfers) would be affected by the project. However, these revenue sources are generally less important than property taxes.

The costs to cities, school districts, special districts, and counties would increase as the demand for services increases with additional worker and family that moves to the two-county area. Impact costs could include capital outlays, personnel costs, administrative, and support costs. These costs would comprise the "full" cost of impacts.

Park County, MT would have primary responsibility for community service and infrastructure effects from the project, including those occurring in the unincorporated communities of Cooke City and Silver Gate. Park County and the affected school and special districts would obtain most of their project-related revenues from property taxes. Total property tax revenues would begin in the second year of a project and likely exceed $1.2 million by year 5 for the NWP. If additional mines are developed, property tax revenues would also increase.

Another major source of revenue would be the metal mines license tax. Again, the NWP proposal is used as an example

TABLE 3-11: ESTIMATED DIRECT PROPERTY TAX REVENUES FOR PARK COUNTY, MT JURISDICTIONS

Property tax receipts (M$)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
County levy	0	5	16	169	322	318
Countywide education	0	8	23	241	459	454
Gardiner High School Dist.	0	5	14	149	283	280
Cooke City elementary Dist.	0	2	5	50	95	93
Cooke City fire districtt	0	1	3	34	65	64
County planning	0	0	0	3	5	5
Soil/water conservation	0	0	0	2	4	4
University millage (State)	0	1	2	16	30	30
Totals (M$)	0	22	63	664	1263	1248

Note: Taxable valuations provided by Crown Butte. There is no consideration of tax base sharing possibilities. A Statewide School Equalization Levy is not included in analysis. High School students from the Cooke City area would attend school in Gardiner. Assessment would occur in the year following valuation. Half of taxes due would be paid in the assessment year, half in the following year. The 1994/1995 mill levies are used in the analysis. Data Source - NWP Technical Report for analysis (Table 3-12). Montana levies this tax on the gross value of the mineral produced in excess of $250,000. Gross value of project production would be subject to taxation at the rate of 1.81 percent of the value of the concentrate produced at the site and shipped off-site. Hard rock mines that pay metal mines license taxes are not required to pay the Montana Resource Indemnity Trust Tax.

Twenty-five percent of the Montana's metal mines license tax revenue is allocated to the county in which the mine is located. After reserving 40 percent of the county allocation in a trust reserve account, one-third of the remainder would be allocated to the county for planning and economic development activities, one-third would be allocated to affected high school district(s), and one-third would be allocated to affected elementary school district(s).

The trust reserve account may be expended only following a 50 percent reduction in the mine's workforce or following the mine's closure. Local jurisdictions do not begin to receive revenues until about year 4 of the project. Total annual metal mines license tax revenues accruing to affected jurisdictions are estimated to peak in the fifth year at about $131,000.

Because potential mine/mill complexes would not be in Wyoming, Park County, WY would not receive property taxes on potential facilities.

Unmitigated fiscal effects on affected jurisdictions are summarized in Tables 3-13 through 3-16. These net effects of costs and revenues are preliminary assessments from available information. The analysis incorporates major potential State diversions to local governments (e.g., sales taxes) but does not consider the specific effects of State equalization programs for education property tax redistribution. School districts in both Montana and Wyoming rely primarily on State funding for operation revenues. The intent of the equalization programs in these states is to provide each school district in the state with sufficient revenue to meet a guaranteed minimum funding level for educational services and facilities.

The effects on school districts could be mitigated through a voluntarily negotiated Impact Plan process in Wyoming. While a mining operator may assist in mitigation for effects on Wyoming school districts through this process, State of Wyoming Foundation Program funds would also likely be available to these districts on a per-student basis. Because funds are distributed based on prior-year enrollment, funds would not be available through the Wyoming Foundation Program during the construction period. If the Wyoming Foundation Program remains intact, project-related effects on Wyoming school districts would be mitigated with Foundation funding after the construction period. Because the Foundation program is not self- supporting, some portion of funds distributed by the Foundation program would be borne by the State of Wyoming General Fund.

Project closure or temporary shutdowns could adversely affect local governments and taxpayers if community infrastructure or services are over-developed due to potential project demands. It would be important for county planners and governmental leaders to consider project closure in their budgeting and planning decisions. A trust reserve account from Metal Mines License Tax revenues could be used to mitigate closure effects in Montana.

TABLE 3-12: ESTIMATED METAL MINES LICENSE TAX REVENUES - MONTANA

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Gross proceeds (M$)	0	0	35,608	48,336	44,002	41,916
Tax paid (M$)	0	0	0	640	870	792
Allocation to Park County (25%)	0	0	0	160	218	198
Trust reserve account (40%)	0	0	0	64	87	79
Affected jurisdictions (60%)	0	0	0	96	131	119

Note: Analysis and assumptions based on NWM. Gross proceeds provided by Crown Butte. Tax rate of 1.81 percent on gross proceeds greater than $250,000. Taxes paid in the year following production. Affected jurisdictions would include Park County and school districts, dependent upon Tax Base Sharing decisions negotiated with Crown Butte. Data Source - NWP Technical Report

TABLE 3-13: POTENTIAL UNMITIGATED NET EFFECTS OF GOVERNMENTAL COSTS AND REVENUES - PARK COUNTY, MT

Major revenues (M$):	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Property tax	0	5	16	169	322	318
Metal mines license tax	0	0	0	32	44	40
Total	0	5	16	201	366	358
Major costs (M$):						
Existing programs	22	32	33	30	30	30
Cooke City services	100	80	80	80	80	80
Total	122	112	113	110	110	110
Surplus (shortfall)	(122)	(107)	(97)	91	256	248

Note: Analysis does not consider the effects of state diversions, tax base sharing, and other unknowns. (NWP Technical Report)

TABLE 3-14: POTENTIAL UNMITIGATED NET EFFECTS OF GOVERNMENTAL COSTS AND REVENUES - PARK COUNTY, MT SCHOOL DISTRICTS (COMBINED)

Major revenues (M$):	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Property tax	0	15	42	440	837	827
Metal mines license tax	0	0	0	64	88	80
Total	0	15	42	504	925	907
Major costs (M$):						
Existing programs	25	61	138	134	134	134
Cooke City facilities/staff	80	80	80	80	80	80
Total	105	141	218	214	214	214
Surplus (shortfall)	(105)	(126)	(176)	290	711	693

Note: Analysis does not consider the effects if state education levy or state equalization programs, tax base sharing, and other unknowns. (NWP Technical Report)

TABLE 3-15: POTENTIAL UNMITIGATED NET EFFECTS OF GOVERNMENTAL COSTS AND REVENUES - PARK COUNTY, WY, CODY, AND POWELL (COMBINED)

Major revenues (M$):	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Property tax	0	10	20	30	30	30
Sales taxes/fees	5	25	80	100	100	100
Total	5	35	100	130	130	130
Major costs (M$):						
Existing programs	151	190	177	169	169	169
Hazardous materials	20	5	5	5	5	5
Total	171	195	182	174	174	174
Surplus (shortfall)	(166)	(160)	(82)	(44)	(44)	(44)

Note: Analysis does not consider the effects of state diversions and other unknowns. (NWP Technical Report)

TABLE 3-16: POTENTIAL UNMITIGATED NET EFFECTS OF GOVERNMENTAL COSTS AND REVENUES - PARK COUNTY, WY SCHOOL DISTRICTS (COMBINED)

Major revenues (M$):	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Property tax	0	15	30	45	45	45
Total	0	15	30	45	45	45
Major costs (M$):						
Existing programs	35	54	196	178	178	178
Total	35	54	196	178	178	178
Surplus (shortfall)	(35)	(39)	(166)	(133)	(133)	(133)

Note: Analysis does not consider the effects of state education levy or state equalization programs, tax base sharing, and other unknowns. (NWP Technical Report)

Other actions that would cumulatively effect government finance include mine reclamation, powerline construction, and residential development.

In recent years, employment and population in the study area have grown, and in response, governments have provided additional services and infrastructure, in many cases without sufficient tax revenue increases. Without mitigation (*e.g.*, the Impact Plan processes) mining projects would add to the budget strain on affected jurisdictions in Montana and Wyoming. Because of the many uncertainties involved, the future cumulative budget status for affected jurisdictions cannot be quantified at this time. If necessary, actions could be taken by these jurisdictions to lessen future cumulative effects (tax increases, user fees, impact fees, etc.). Issues related to the "fairness" of future tax revenues would continue to be of concern to study area businesses and residents.

If powerlines are built from Cody, WY, the transmission facilities would generate property tax revenue for Park County and Cody and Powell school districts. This would not vary regardless of the number of new mines.

Sales taxes, property taxes due to new residential and commercial development, fees, and State diversions would also accrue to the county, with very limited amounts accruing to Cody and Powell.

The State of Wyoming could be responsible for transportation and road costs associated with plowing US Highway 212 and Wyoming Highway 296 (Chief Joseph Scenic Highway). While the jurisdictional responsibility and other issues associated with road plowing and maintenance have not been determined, the State of Wyoming Transportation Department may bear the cost of equipment and manpower, estimated at about $150,000 to $200,000 annually. More money would be needed for road improvements if more than three trucks haul large loads over the highway each day. Yellowstone NP estimates that a capital investment of approximately $750,000 to purchase heavy equipment, sand and equipment storage sheds, a fuel station, snow guides, signs, and gates would also be needed.

The cost of road maintenance and accelerated road improvements in Wyoming may be partially offset by Wyoming fuel taxes for fuel purchased in Wyoming. For an estimated two haul trucks per day round trip from Cody to the mine site, Wyoming fuel tax revenues could be about $2,500 per year. For any off-site tailings disposal alternatives, the fuel tax revenues would be incrementally higher (*e.g.*, 20 trucks per day would yield about $25,000 per year). Other project-related traffic resulting in fuel purchases in Wyoming (vendors, employees, etc.) and license fees allowing interstate transport of materials would generate other relatively minor tax revenues. These revenues are distributed to the State Transportation Fund, which funds highway projects throughout the State on a prioritized basis. It is unknown how much of these funds would be used to repair project related road effects.

The cost of road maintenance would increase with the number of mines. However, it should not be proportionate. For example, if 2 mines are operating at the same time, snow plowing of the highway should serve both mines.

A 1996 amendment to the Wyoming Industrial Development Information and Siting Act would provide substantial revenues to the State of Wyoming for the off-site tailings disposal alternatives. The amendment provides that the disposal of waste as proposed in off-site tailings alternatives would be subject to a surcharge of a minimum of $10 per short ton of solid waste received at the facility. These funds would be deposited in the Wyoming general fund. For off-site tailings disposal for the NWP, this surcharge would generate a minimum of $3.31 million annually.

The net effects of mine reclamation, powerline construction, highway construction, recreation use, and residential development on public revenues and government finance would depend on the amount and timing of these activities.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

The analysis of this scenario is based on the anticipation of one mine and five exploration operations.

Although the likelihood and amount of mining anticipated under this Scenario is much less than with Scenario A-1; if mining did occur, impacts on government finance would be similar in nature to those described for Scenario A-1. The extent of impacts would depend on the size, and period the mine operates.

Other actions that could cumulatively effect government finance include mine reclamation, powerline construction, plowing Highway 212 east of Cooke City, highway construction, recreation use, and residential development. Government finance effects associated with these actions would be similar to those discussed for Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

The analysis of this Scenario is based on the anticipated development of the NWP, and the less likely possibility of two other mines. Seven exploration operations are also analyzed.

The nature of impacts on government finance would be similar to those described for Scenario A-1. Increased demand for services as a result of mining could cause Park County, MT government and school districts to run a short-term deficit and Park County, WY government and school districts to run a long-term or indefinite deficit. Although some of the shortfalls could be mitigated through tax base sharing and state equalization programs, these programs are not always guaranteed and usually do not provide funds immediately.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this Scenario, no mining is anticipated. Consequently no changes to government finances would be anticipated. The economy would continue to grow as a result of predicted growth in the tourism industry but probably at a slower rate than it would have if the mining described in the above scenarios had occurred and the resulting the government revenues and cost would change accordingly.

Other actions that could cumulatively effect government finance include mine reclamation, highway construction, recreation use, and residential development.

The amount and extent of these effects are unknown.

Mitigation of Effects

Under terms of the Montana Hard-Rock Mining Impact Act and Property Tax Based Sharing Act, a project may qualify as a large-scale mineral development requiring the development of an Impact Plan. The Impact Plan would identify affected jurisdictions, and require the operator to pay for costs resulting from project-related impacts to local government finances. The Impact Plan must be approved before an operator begins. Since the content and subsequent fiscal effects of an Impact Plan constitute a negotiated agreement between an operator and the affected local governments, specific fiscal effects are uncertain. The application of tax base sharing would not be determined until an Impact Plan is finalized.

The Impact Plan process required by Montana does not apply to Wyoming jurisdictions. However, a mining operator, as previously mentioned, could agree to use a similar procedure in Wyoming. A summary of the Hard-Rock Mining Impact Act for Montana is included in Appendix G.

SOCIAL

Substantive Changes Between the Draft EIS and Final EIS

In the Introduction, a section was added to address the concern by Park County Wyoming County Commissioners that the estimated effects of potential mining projects on employment and population were underestimated.

In the Introduction, a section was added to address Environmental Justice concerns.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Population" information was added to address the upper limits of population change.

In the Affected Environment section, under the subheading "Quality of Life," a section was added discussing the concerns of Park County, WY officials and residents.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Quality of Life" information was added to address effects of the upper limits of population change.

In the Affected Environment section, under the subheading "Community Services and infrastructure," a section was added on Electrical Power Supply.

In the discussion of the effects of Alternative Scenario A-1, under the subheading "Quality of Life" information was added about Park County, Wyoming residents' and officials' concerns that Crown Butte would not be able to enforce the proposed employment policies that would prohibit most mine employees from locating their residences in the communities of Cooke City, Silver Gate, Sunlight Basin or Crandall.

Introduction

The area considered in this social impact analysis encompasses Park County, Montana and Park County, Wyoming. Adjacent public land jurisdictions, including Yellowstone NP and National Forest (USFS) lands are also considered in the analysis. Although the area is a historic mining district, its diversity of high value of resources and proximity to Yellowstone NP have made mining activity in and around the study area an issue at the local, state, national, and international level.

Due to their close proximity to the proposed withdrawal area, the unincorporated communities of Cooke City and Silver Gate, Montana would be most affected by the proposed withdrawal and the limitations it would place on mining activities. Other communities that would also be affected, but to a lesser degree, are Gardiner and Livingston in Park County, Montana and Cody, and Powell in Park County, Wyoming. Livingston, Cody, and Powell are incorporated cities.

Residents of Cooke City and Silver Gate include both permanent full-time and seasonal residents. Seasonal residents come to the area during the summer months for vacation or retirement purposes. They often have outside income sources such as retirement or investments. Permanent residents generally depend on area resources to make a living. This dependence includes not only extractive industries such as mining, but also a high level of service-oriented recreation and tourism business.

The economies of Cooke City and Silver Gate are seasonal. Winter access to the area is limited by inclement winter weather which closes two of the three transportation routes. US 212 east of Cooke City is closed during the winter. Winter travel from Cooke City is limited to U.S. 212 west through Yellowstone NP and then north to Gardiner. This isolation has contributed to the development of a seasonal economy, high transportation costs, and a relatively high cost of living. There is no commercial passenger service to the area and heavy commercial freight must come from the east during the nonwinter months.

The social environment of an area is defined by a wide variety of factors such as social organization, leadership, lifestyles, values, and expectations. Quality of life is also an important consideration and can encompass the factors above as well as a wide variety of elements such as clean air, clean water, recreational opportunities, area aesthetics, etc. It also is influenced by elements of the standard of living such as economic opportunity and comforts. Impacts on the quality of life and the social environment are generally measured qualitatively. Individual perceptions about all of the above factors and the net outcome of potential impacts on them, tend to be subjective and personal, depending on the values, beliefs, and social structures of the individual or group.

Concerns expressed during scoping for the withdrawal and its alternative of no action dealt with impacts relative to the character of the area and quality of life. Related concerns were also expressed about population changes, available housing, and community services. Concerns were expressed not only by local residents but also by individuals nationwide, who view the area as a unique national/international resource that must be protected for future generations.

Measurement indicators were identified by the agencies to assess the effects of the proposed action and alternatives in each issue area. The issues, measurement indicators, and the units of measure that will be used to measure effects are outlined in Table 3-17.

After publication of the DEIS, concern was expressed by County Commissioners of Park County, WY that the estimated effects of potential mining projects on employment and population were underestimated. Their concern was based on an interim report on the potential effects of the proposed New World Project prepared for them by Planning Information Corporation (PIC). PIC projected a higher population increase in Park County Wyoming than

TABLE 3-17: ISSUES, MEASUREMENT INDICATORS, AND UNITS OF MEASURE

ISSUE	MEASUREMENT INDICATOR	UNIT OF MEASURE
Effects on population	Direct and indirect immigrants	Population
Effects on community services and infrastructure	Availability of services and Infrastructure	Potential capacity and type
Effects on housing	Available housing stock	Number of housing units
Effects on social structure, social character, and quality of life	Possible changes in lifestyle, quality of life, and psychological/social well-being	Qualitative: narrative description

was contained in the DEIS. Estimates contained in the DEIS were taken from the NWP PDEIS Social Technical Report.

The agencies acknowledge that estimates can vary widely depending on the methodology used. In order to allow for differences in opinion regarding the best methodology to use, it was appropriate to identify a range of potential impacts. The MicroIMPLAN economic impact model was used to project the upper limits of potential employment and population impacts. Throughout the analysis of effects on the social environment, impacts have been estimated based on the lower population impact estimates contained in the NWP PDEIS Social Technical Report. If mining related population growth were to reach the levels projected by PIC or those projected under the MicroIMPLAN model, the types of effects described would still occur, although the magnitude and/or intensity of their impact would be substantially greater.

Environmental Justice

During the course of this analysis, no alternative considered resulted in any identifiable effects or issues specific to any minority or low income population or community. The agencies have considered all public input from persons or groups regardless of age, race, income status, or other social/economic characteristics.

The race and Hispanic origin of the population of the two counties within the study area are displayed in Table 3-18. Neither the proposed action nor mining activity would be expected to result in any significant change in these demographics. If mining were to occur, there would likely be a small change in the relative size of the age groups present in the area. The 1990 Census reported that 25.3 percent of the population of Park County, MT was under the age of 18 and 15.7 percent was over the age of 65. Within Park County, WY 28.1 percent of the population was under age 18 and 13.3 percent was over age 65. If mining were to occur, the majority of immigrants would fall within the 18 to 65 age group. However, since the county-wide population impacts would be relatively small, the effect on the relative size of population age groups would not be significant.

TABLE 3-18: 1990 CENSUS OF POPULATION AND HOUSING

Race and Hispanic Origins of the Study Area Population		
Race	**Park Co., MT**	**Park Co., WY**
White	97.7%	97.4%
Black	0.5%	0.1%
Native Am.	0.8%	0.6%
Asian or Pacific Islander	0.5%	0.5%
Hispanic	1.6%	3.6%
Other	0.6%	1.5%

1990 Censes of Population and Housing

For those persons for whom poverty status was determined, the 1990 Census revealed that 15.3 percent of the population in Park County, MT and 9.5 percent of the population in Park County, WY were below the poverty level. The proposed action would have little effect on these persons. Potential mine development under the no action alternative would provide an increase in the number of higher paying jobs available for area residents to apply for, thereby increasing the potential for some low income individuals to improve their standard of living.

Population

Population changes can cause significant changes in the social environment of the area. Limited infrastructural and housing capacities in some locations could be affected by population increases.

Affected Environment

Park County, Montana

Table 3-19 displays the 1990 Census population and the average rate of population growth for Park County, MT and Cooke City/Silver Gate, Montana. In the ten-year period from 1980 to 1990, Park County's population increased 12.6 percent. The largest population growth occurred from 1988 to 1990. From 1990 to 1994 the population has increased another 6.8 percent.

TABLE 3-19: POP. AND AVG. ANNUAL RATE OF POP. GROWTH FOR PARK COUNTY, MT AND COOKE CITY/SILVER GATE, MT

Characteristic	Park County	Cooke City/Silver Gate
Population:		
(1990 Census)		124
(1994 MT Census & Econ. Info. Ctr)	15,560	
Est. Avg. Annual Pop Growth Rate:		
(1980-1990)		4.2%
(1980-1994)	1.3%	

The populations of Cooke City and Silver Gate increased 125 percent from 1970 to 1990. However, in 1990 census boundaries changed, therefore, the rate of growth indicated may not be accurate. Census figures also do not reflect the seasonal nature of the population. Table 3-20 displays a population estimate including seasonal residents.

Although gateway communities to Yellowstone NP generally have highly transient populations, both year-round and seasonal populations of Cooke City and Silver Gate have shown remarkable longevity and stability. Seasonal residents have been in the community an average of 25 years, six years longer than year-round residents.

TABLE 3-20: COOKE CITY AREA PERMANENT/SEASONAL POPULATION SEGMENTS—1991

Location	Permanent Population	Seasonal Population
Cooke City	66	169
Silver Gate	27	149
TOTAL	93	318

Park County, Wyoming

The population of Park County and the communities of Cody and Powell increased significantly between 1940 and 1990. The state's population increased by 81 percent during this 50-year period. However, from 1980 to 1990 the state's population declined. The 1990 Census population and average yearly rate of population growth for Park County, Cody, and Powell are displayed in Table 3-21. The County population has increased steadily since 1990. The populations of Cody and Powell have also increased since 1990.

TABLE 3-21: POPULATION AND ESTIMATED ANNUAL RATE OF POPULATION GROWTH FOR PARK COUNTY, CODY, AND POWELL

Characteristic	Park County	Cody	Powell
Population:			
(1990 Census)		7,897	5,292
(1994 WY Dept. of Admin. & Fiscal Control)	24,928		
Est. Avg. Annual Rate of Pop. Growth:			
(1980 - 1990)		2.2%	0.5%
(1980 - 1994)	1.0%		

Future Population Estimates

Table 3-22 displays population estimates for Park County, MT and Park County, WY through the year 2005. These estimates provide a baseline and do not reflect the effects of mine development.

The Montana Census and Economic Information Center and the Wyoming Department of Administration and Fiscal Control report that the population of both counties is projected to grow less than 1 percent per year on average. Park County, MT is projected to grow 9.2 percent and Park County, WY 3.6 percent from 1995 to 2005.

TABLE 3-22: POPULATION PROJECTIONS—PARK COUNTY, MT AND PARK COUNTY, WY

Location	1995	2000	2005
Park County, MT	15,470	16,220	16,900
Park County, WY	24,430	24,910	25,300

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

The Forecast for Mineral Activity, which was developed as one possible Scenario for analysis purposes (Table 3-2), assumes the New World Project would be developed. It also assumes two other mines of similar size could occur, but would be much less likely. Up to 10 mineral exploration operations may occur.

Each mineral exploration program could employ up to nine seasonal workers and operate for two to three years. The effect on the seasonal population would not be measurable.

Projections for the New World Project for this issue and those that follow were obtained from the Social and Economic Technical Report for The New World Project.

The NWP, if developed, could employ approximately 200 workers during full production and operate for 8 to 15 years. The peak population growth projected by ERO Resources is about 320 persons, less than 1 percent of the total population for both Park County, MT and Park County, WY. The impact study prepared by PIC projected a population increase in Park County, WY of 314 persons during the peak construction. The MicroIMPLAN economic impact model projected an upper limit of approximately 1,285 new residents in the two county area. Based on the assumption that two thirds of mine workers would live in Park County, WY, approximately 860 new residents would be projected in Park County, WY and 425 in Park County, MT under this methodology.

The majority of the population increases would occur in Cody and Powell, WY. Because of the lack of private lands available for development and limitations on infrastructure, it is anticipated that any company proposing to open a mine in the New World District would restrict residency in the Cooke City and Silver Gate. The peak population growth in these communities could be about 50 persons. This represents 50 percent of the current and historic year-round population and about 13 percent of the combined year-round and seasonal population.

Such an immigration could have numerous effects on the Cooke City/Silver Gate area. The effects on the social structure, character, and quality of life of the area, as well as on the infrastructure and housing are discussed in the sections that follow. They may be viewed as beneficial or detrimental depending on the individual or group and their goals and values.

Other mines, if developed, would have similar effects as those projected for the NWP, depending on their size and location. Mines would not be expected to be in full operation concurrently, however, there could be overlaps between the startup phase of one mine and the shut down phase of another. Such overlaps could increase the magnitude and duration of effects beyond those described above, depending on the degree of overlap. It is unlikely, however, that Cooke City and Silver Gate would be able to accommodate more than about 50 additional residents because of the limitations on the water supply, sewage treatment, and available land. Should there be an operational overlap of two mines, the population increase resulting from the second mine would likely be required to live in the more distant communities within the study area.

Mining could necessitate snow plowing of Highway 212. Year-round access to Cody would increase the area's accessibility to winter recreationists and could result in higher levels of winter use. Such a change could increase the need for added service personnel.

Mine reclamation, powerline construction, and highway construction could create small temporary population increases while active.

Population growth related to recreational use is expected to increase with or without mining in the New World District. The effect mining may have on the rate of that growth is unknown. Recreational use could be affected in localized areas. Some users could leave and others could relocate to other areas. However, there is insufficient information available to accurately predict the net effect on the area's population.

The highways between Mammoth and Cooke City and between Cooke City and Cody, WY are expected to be upgraded and realigned during the next 20 years. Such activity could result in small, temporary, seasonal population increases during project activities.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

The Forecast for Mineral Activity (Table 3-2) assumes there is a 2% probability of an underground mine and the potential for up to five exploration operations.

If developed, a mine would be expected to have effects similar to those described for the NWP discussed under Scenario A-1 above, depending on the size and location of the mine. The effects of each exploration operation would also be similar as those described under Scenario A-1. The NWM Agreement significantly reduces the potential for mining related changes to population in the study area. The area of highest mineral potential is no longer available for development. The NWP would not be developed and the potential for additional mines is reduced.

Other activities that are likely to occur under this Scenario include mine reclamation, powerline construction, and year-round snow plowing of Highway 212 east of Cooke City. The effects of these activities would be the same as discussed under Scenario A-1.

Cumulative effects from highway construction and growth in recreational use would also occur under this Scenario. Their effects would be the same as discussed under Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

The Forecast for Mineral Activity, which was developed as one possible Scenario for analysis purposes (Table 3-2), assumes the New World Project would be developed. Up to seven mineral exploration operations may occur. It also assumes two other mines of similar size could occur, but would be much less likely.

The effects on population are similar to those described under Scenario A-1, due to likely development of the NWP. The area of highest mineral potential remains available for mining. Additional mines could be developed, although the probability is somewhat lower than in Scenario A-1 and only seven exploratory drilling operations are anticipated instead of 10. The cumulative effects would be the same.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

The Forecast for Mineral Activity, which was developed as one possible Scenario for analysis purposes (Table 3-2), assumes no mines would be developed and one exploration operation is possible.

No population effects would occur as a result of mining. The single exploration operation could provide seasonal employment for about nine persons. The effects on population would be negligible. Some mine reclamation activities could also occur, causing small, seasonal population increases when active. Cumulative effects would be the same as described under Scenario A-1.

Quality of Life

Affected Environment

Park County, Montana

Park County, Montana has a long history of both consumptive and nonconsumptive uses of natural resources. The area's rich mineral deposits, spectacular scenic beauty, high quality outdoor recreation, and proximity to Yellowstone NP have been and continue to be factors shaping the history of the area.

Cooke City's early economy was based on mining and shifted to tourism and recreation in the 1930's. The founding of the community of Silver Gate, one mile from Yellowstone NP, in 1935 and construction of the Beartooth Highway in 1936 stimulated tourism. By 1937, there were 59 cabins, a gas station, a tavern, and a few stores in Silver Gate. The last major mining activity was the McLaren Gold Mine in 1953.

During the summer, seasonal residents increase the population of the Cooke City/Silver Gate area by four to five times the number of year-round residents. Permanent residents often are service providers to tourists and recreationists, employees of the National Park Service and Forest Service, and retirees. Seasonal residents typically live in the area during the summer months and maintain primary residences outside of the area for the majority of the year.

Residents and visitors are attracted to the area by the spectacular scenery, abundant wildlife, unique geologic features, and solitude. The quality of outdoor recreational experiences offered by the area is extremely high. Many people obtain spiritual renewal and tranquility from the natural environment found in and around the study area.

Neighboring Yellowstone NP is valued as a national and international treasure to be enjoyed and preserved for future generations. Areas surrounding the Park are viewed by many local residents and others from around the United States and the world, as an integral part of the Park ecosystem.

Both permanent and seasonal residents perceive social class distinctions based on period of residency. Business owners and merchants generally are perceived as having more influence than are nonproperty owners who frequently work at temporary jobs. In addition, social separation apparently exists based on views about future development.

Local residents perceive that they have little control over important decisions such as the allocation of tax revenues, development of mining, and provision of community services. They feel that these decisions are made by individuals or agencies over which local residents have little or no influence. There is a general perception that Cooke City and Silver Gate are largely ignored by county government because the area has few voters and is very distant from the county seat.

Other factors contribute to the feeling of lack of control. Tourism and recreation, major sources of community income, are dependent upon visitors who often come from outside of the region or the state. Visitation levels depend upon the seasonal attractiveness of Yellowstone NP, weather, gasoline prices, and other factors outside of the community influence. Commercial access to Cooke City and Silver Gate in the winter is totally controlled by Yellowstone NP.

The Crown Butte survey of Cooke City and Silver Gate residents revealed a belief that resources and power are unequally distributed. Twenty-eight percent feel that county commissioners have the most power to determine the future of the area followed by the federal government (27 percent), environmental groups (12 percent), small businesses (8 percent), and the general public (2 percent). Year-round, local business people are also thought to have influence and political power by virtue of their wealth and access to county officials. A 1993 survey conducted by Rob Corkran asked a similar question. Nearly two-thirds of the respondents felt that Crown Butte Mines/Noranda would have the most power if the New World Project were permitted.

When important events, such as the 1988 Yellowstone NP wildfires occur, ad hoc committees or groups formed to address the potential effects on the community. The Beartooth Alliance and the New World Mining Impact Committee were formed to focus community concerns about regulation and siting of the New World Project and provide a voice for local concerns.

Cooke City and Silver Gate both have a small town atmosphere, with solitude during most months of the year. Mutually supportive networks of family and friends are valued by residents. People respond to each other in an informal and personal manner, know nearly everyone in town, and are aware of an individual's character, occupation, and socioeconomic status. The social interactions between the pro- and anti-mining factions have become strained as a result of the strong emotions tied to the New World project.

A 1990 Crown Butte survey showed the existence of concerns dealing with a lack of community togetherness, high rates of alcohol consumption, substance abuse, limited social life, substandard housing and public facilities, the lack of year-round jobs with reasonable incomes, substandard law enforcement, and the potential of mining coming to the area. Negative comments were also received about the control of Yellowstone NP, the USFS, and other agencies over many facets of their daily life.

Most positive comments extolled the natural environment, appreciation of wildlife, quality of life, serenity, recreation, and privacy of the area. In Corkran's survey, residents were asked to rate social and economic factors as to their importance to the future success of the communities. Clean environment, recreation and tourism, and a low crime rate were rated by both year-round and seasonal residents as the three most important factors. The overall quality of life was rated as above average by 70 percent of year-round residents and 75.8 percent of seasonal residents.

Many respondents to the Crown Butte survey had concerns about the potential for mine development. They felt that although the New World Project would build the economy, the positive effects would be short-term. Concerns mentioned were the possibilities of removing snowmobile trails, mobile home placement among existing housing, mobile home park developments, and displacement of seasonal help and tourists due to mining personnel occupying existing housing units. Corkran's survey found that of year-round residents responding to the survey, 54.6 percent rated the development of mining as "Not Important" to the future success of the community. Of seasonal residents, 67.5 percent responded in a similar manner. The "Potential for Mining in Area" was rated as the item least liked by 50 percent of year-round residents and 63.1 percent of seasonal residents.

Table 3-23 displays examples of the wide spectrum of community viewpoints about the development of a major mineral project within the study area. It provides a synopsis of the many reasons for the opinions expressed regarding the issue of minerals development, but should not be considered all inclusive.

Park County, Wyoming

Petroleum and tourism industries have been important social and economic factors since the pioneer days. Farming is also an important component in the Big Horn Basin. Ranchers are perceived by some to be conservative landowners with relatively large amounts of political influence and economic resources. Some are retired executives from out-of-state and others are longtime residents whose families date from the homesteading days.

A 1990 Crown Butte survey indicated that slightly more than 90 percent of Cody residents interviewed believe that

TABLE 3-23: EXAMPLES OF THE SPECTRUM OF COMMUNITY VIEWPOINTS ON A MAJOR MINERAL PROJECT

Favor mineral projects: Why		**Uncertain**	**Oppose mineral projects: Why**	
Energetically promotes development.	***Generally supports development with environmental safeguards.***	***Neutral, uncommitted or ambivalent.***	***Generally opposes development but not unconditionally.***	***Energetically opposes development.***
Expect to gain personally—money, power, or status.	Job or investments at stake. Believes development need not lead to environmental ruin; we can now avoid this.	Perplexed; uncertain of what position to take—costs and benefits seem equally balanced.	Believes we need this kind of development but not in our locality (because of its special qualities).	Job or investments at stake. Expects to lose personally—money, power, or status.
Represents an organization that expects to profit from development.	Thinks the local community would benefit economically; e.g., increased spending, reduced unemployment.	Organization favors it but s/he thinks costs probably outweigh benefits for the community at large.	Thinks selected projects would be acceptable if carefully screened, planned, and scheduled to avoid most adverse effects.	Represents an organization that expects to profit or attain its goals if development is halted.
Strong personal commitment to such values as: free enterprise, progress, materialism, consumption.	Thinks s/he would personally benefit, or perceives development as essential to the U.S. economy.	Informed on the issue but indifferent about what happens.	Thinks s/he would lose money or other values would be threatened: hunting, fishing, cheap land, local lifestyles, existing economic activities.	Strong personal commitment to such values as: conservation, ecological balance, preservation.
Believes technology can solve any problem it creates; it is merely underutilized.	Finds this the politically most expedient position to support.	Uninformed; no opinion; has not thought about it.	Opposes development because of peer pressure from friends, co-workers, or ethnic group.	Believes the very survival of humanity is now threatened by pollution, resource depletion, or other types of environmental changes.
Thinks the planet is still rich in resources and environmental degradation is manageable.	Concerned about specific issues: national and regional energy shortages, our dependence on foreign oil, international balance of payments, defense readiness, etc.	Includes: would like to be informed, might then have an opinion; do not care about it; could not do anything about it anyway.	Concerned about specific issues: adequacy of natural resources for future generations, effects on wildlife, air pollution, water pollution, noise, crime, inflation, etc.	Thinks current population growth rates dictate far less per capita consumption.

Source: Wenner, 1992

social classes exist in the community. Most respondents felt that social stratification was based primarily on affluence which also was linked with political influence and control.

Respondents felt that the community is stratified into groups identified as ranchers, retired people, laborers, and business and professional people. In addition to these groups, community distinctions were based on relative wealth and access to political power. Community interaction appears to occur most often within social strata rather than between.

The primary social problems identified by respondents to the Crown Butte survey were drug and alcohol abuse among the young and teenage pregnancy. Respondents liked the natural environment and appreciated the low crime rate and relaxed atmosphere. Negative comments concerned the harsh climate, high prices, city and county government, and the seasonal influx of tourists.

Seventy-nine percent of the respondents reported that they had no concerns about the proposed New World Project. Positive impacts focused on an economic boost through increased jobs and business activity. Negative impacts mentioned were environmental degradation, increased traffic and road accidents, and the potential for people with deviant behavior moving into the area to work at the mine. More recent surveys now indicate a high degree of concern about the New World Project. Cody Chamber of Commerce surveys show a decline in support for the New World Project and an increase in opposition. Chamber members changed their position from one of "conditional support" in 1993 to a solid "oppose" position in 1995.

Park County, WY officials expressed serious concerns regarding the proposed New World Project. Comments received from County government about the Preliminary Draft EIS for the New World Project indicated concern that estimated benefits to the county had been overestimated and that the costs and negative impacts had been understated. Officials feel that while much of the costs related to the development of a mine would fall on Park County, WY, most of the economic benefits would remain in Montana.

The PIC impact study, provided by Park County, WY, found that the number one issue for residents and officials of Park County was the risk of degradation of the Clarks Fork River. The report again stated that many residents feel that Wyoming bears all the risk, while Montana would receive all of the economic benefit of the New World Project. The PIC study also identified a concern that the introduction of an industrial stream of traffic in an area which has historically been used primarily by recreation visitors and local residents will diminish the attractiveness of the resource and result in a deterioration of the quality of life for area residents who use and value this resource. A further concern identified was the potential for the need to reconstruct the Chief Joseph Scenic Highway at the same time that the US 14/16/20 (East entrance to Yellowstone Park) is being reconstructed, thus affecting visitor traffic through Park County. The report points out however, that this effect could be mitigated by coordinating any reconstruction of the Chief Joseph Scenic Highway so that is not started until the North Fork Highway is completed. Despite these concerns, however, and in response to publication of the DEIS, County Commissioners of Park County, WY have expressed strong opposition to the proposed withdrawal largely because they feel that it would set an undesirable precedent.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

There is a polarization of interests and attitudes regarding mining in the Cooke City/Silver Gate area. Table 3-23 describes some of the viewpoints behind the opinions expressed by area residents. Although proponents and opponents of mining value existing social and environmental qualities of the area, proponents feel that the opportunity for profit and positive changes in lifestyle and quality of life outweigh the negative effects to the existing social and environmental qualities. If mining were to occur, proponents could gain a greater sense of control and many could seek ways to take advantage of new economic opportunities.

Among opponents, there is a strong perception among some that a major industrial development in an area with such high resource values is inappropriate. Any perceived risk that degrades area resources is unacceptable to those who share this view. Many mining opponents feel that mine related opportunities for profit or positive change would be outweighed by negative changes in lifestyle and quality of life. Even some business owners who choose to close in the winter are not motivated to change their lifestyles in return for increased economic opportunity.

If mining occurs, opponents could feel frustrated because they had been unable to control factors affecting their lifestyle and quality of life. They might feel that mining was forced on them by outsiders with no real stake in the community. Individual sense of psychological well-being and quality of life could be negatively changed for most mining opponents. Alienation, divisiveness, and lack of community integration could continue between the pro- and anti-mining groups.

After a population increase, existing residents may perceive a reduced sense of community, poor interpersonal relations, and a lack of community integration. Splits could develop between mining supporters and opponents or between old timers and newcomers. Newcomers could have differing expectations and stakes in the community. Their orientation would be toward extractive industry versus tourism and recreation. Therefore, the two groups could have different expectations about the community. Newcomers may not have the long term interest in community values shared by existing residents.

Population growth, together with the introduction of industrial activity could force the disruption of existing social structures and the development of new ones. Structural arrangements of community service organizations could change, which could affect the entire social structure of the community. Political structures and community leadership could also change.

A disparity in income could develop between well-paid mine employees and generally less well-paid local service providers. The lower paid persons could have difficulty competing for goods, services, and housing for themselves and their seasonal employees.

If one or more mines are developed, there could be a decrease in the availability of housing and an increase in housing costs (see discussion of effects on Housing). Intensified competition for housing and housing sites might increase the market and taxable values of existing businesses and residences, placing greater financial strain on existing employers, employees, renters, and property owners.

The integrity of the study area environment has spiritual and/or religious meaning and value for some persons. Such values are highly individualistic and diverse. It is likely that the introduction of industrial activity could cause some residents and back country users to experience a sense of loss and to perceive a reduction in the quality of life that the area has to offer. Additionally, a rapid increase in population, together with increased traffic and commerce, could detract from the sense of solitude currently experienced and valued by many residents and visitors.

Rapid changes, an influx of population, and increased activity may result in increased numbers of strangers, increases in crime, as well as changes in business and travel patterns. The occurrences of stress, anxiety, and depression typically increase under such conditions. New residents may expect indoor recreation as well as outdoor recreation. Inadequate recreation facilities may lead to boredom and increases in alcoholism, crime, and juvenile delinquency.

If the level of population impacts approaches the upper limits of the range identified in the Affected Environment of the Population section, the intensity and magnitude of the impacts to the quality of life described above would increase. The greater the increase in population, the greater the likelihood that larger numbers of current residents and seasonal users would perceive an unacceptable decline in the quality of life.

Year-round opening of the highway between Cooke City and Cody, WY could greatly increase area residents' access to a variety of goods and services as well as health care during the winter months. Cooke City/Silver Gate businesses and individuals may well benefit from cost savings as well as increased selection. For some persons, this could be perceived as an increase in the quality of life offered by the area.

Residents in neighboring communities would not be affected to the same degree as residents of Cooke City and Silver Gate. Some Gardiner residents may not support additional mining, but the community is not as polarized. Although some residents might feel their quality of life could diminish, they probably would not be affected as directly or intensely as Cooke City/Silver Gate residents. Newcomers could have a better chance of being accepted into existing social structures.

Mining would not cause meaningful changes to Livingston's social environment. Some may oppose mining because of individual or group values, but not necessarily because they would be directly affected.

Cody would likely be the greatest source of local hires and home to the greatest number of new immigrants. A relatively small percentage of Cody residents could be affected directly by mining. Many opponents would be likely to base their opinions on individual or group values which support environmental preservation and conservation. Membership opinion surveys conducted by the Cody Chamber of Commerce indicate a high degree of concern about the New World Project. From 1992 to 1995, support has eroded to a position of solid opposition.

Powell residents could be more likely to support mining because of economic development benefits. It is more likely that miners and their families could be accepted into existing social structures because of the area's history of resource development.

Past, current, and reasonably foreseeable future effects of recreation and tourism growth and development would continue to occur with or without mining. These factors have changed and will continue to noticeably change the social condition in the area. The rate of that growth and its magnitude are the result of many complex factors and cannot be accurately predicted.

Some people believe that mine-related growth and development conflicts with current lifestyles and the recreation/tourism economy. Year-round access to the area from Cody together with the development of mining could accelerate and increase the magnitude and number of social changes in the study area over those that could occur without mining activity. The ultimate effects of cumulative change would depend on where projected growth and development occur, the ability of and willingness of residents and local government officials to deal with growth and change, and the level of conflict between the two sources of growth.

National and Worldwide Concerns. Other persons in the U.S. and around the world have also expressed concerns. The protection of Yellowstone NP, known worldwide for its spectacular scenery, abundant wildlife, and unique geologic features, has garnered international attention. Even though they may never have visited Yellowstone NP themselves, many people want to see the Park's resources and the surrounding area preserved for future generations. Although it is unlikely that mining in the study area would cause a change in the social structures for these persons, mineral development could result in a variety of responses including a sense of loss, anger, frustration, etc.

Effects of Alternative A, No Mineral Withdrawal Implemented, Scenario A-2: New World Mine Agreement Implemented

The NWM Agreement would significantly reduce the potential for mining related changes to the existing quality of life offered by the area. The area of highest mineral potential is no longer available for mining. The NWP and other potential mines would not be developed. Planned reclamation may improve scenic integrity and water quality of area streams.

Development could occur on federal lands and private lands available for mining. The mineral forecast projects a 1:50 probability of an underground mine. Depending upon the size and location of any future mine, effects to quality of life could be similar to those described for Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Due to anticipated development on private land and unpatented mining claims, the effects of this Scenario would be the same as described for Scenario A-1. The only difference is that there is a slightly lower probability for the development of the three mines under this Scenario than under Alternative A and only 7 exploration alternatives are projected instead of 10. Cumulative effects would also be the same as discussed under Scenario A-1.

The mineral withdrawal does prevent mining on 17,760 acres of federal land. Scenic integrity, recreation opportunities and roadless areas adjacent to the wilderness and Yellowstone NP would not be directly affected by mining. The potential for mining related changes to the natural integrity of the area are lessened for the 17,760 acres withdrawn.

Effects of Alternative B, Mineral Withdrawal, Implemented, Scenario B-2: New World Mine Agreement Implemented

If the NWM Agreement is implemented, no mines would be projected to be developed in the study area. Although the community is currently polarized over the pros and cons of mining, it is likely that the controversy about mining would gradually lessen or be eliminated. Some people in the study area could feel alienated or "cheated" with or without mining. If the prospect of mining were eliminated, the social structure of Cooke City/Silver Gate could adjust to this decision during the next few years. The existing social pressure associated with development of mining would gradually lessen.

Growth and development would continue to occur without mining. Changes to the existing social environment and quality of life would still occur. Such changes would be more consistent with recent growth trends based on quality of life considerations and the recreational/tourism economy, and would occur gradually and continually. People would continue to be attracted to the area for its amenity values including outstanding scenery, abundant recreational opportunities, and a relatively pristine environment. Real or perceived conflict with industrial activities would be less likely to occur and the existing quality of life and social structure would tend to be maintained.

Community Services and Infrastructure

Affected Environment

Most public services in Cooke City and Silver Gate are provided by Park County or special districts for school and fire. The State of Montana also provides some services and infrastructure to area residents and visitors. Gardiner is moving toward becoming a year-round tourist/recreation based economy. Livingston offers a full range of public services and infrastructure.

The areas in Park County, WY most likely to be affected by mineral developments in the study area are the cities of Cody and Powell. Residents are provided a full range of services by these communities, local school districts, and State of Wyoming agencies.

Schools. Cooke City Elementary School District No. 9 is the only educational facility in the immediate vicinity of the analysis area. Its capacity is 10 to 12 students in grades K through 8. After completing the eighth grade, Cooke City students generally attend high school in Gardiner, approximately 55 miles away. Livingston, Gardiner, Cody and Powell have facilities for grades K through 12 that are operating at or near capacity.

Emergency and Health Care Services. Law enforcement is provided by the Montana and Wyoming Highway Patrols and the Park County, MT and Park County, WY Sheriff's Departments. Cody and Powell also have city Police Departments. A mutual aid agreement allows National Park Service rangers, Montana Highway Patrol officers, and Park County Sheriff's deputies from both Montana and Wyoming to handle law enforcement problems in the Cooke City/Silver Gate area.

Fire protection is provided by the Cooke City/Silver Gate Fire District. Yellowstone NP provides backup through a mutual aid agreement. Because their fire fighting equipment and vehicles are not adequate for major fires, the primary goal of the fire district is to prevent fire from spreading to other structures. Livingston's fire district has a combination of full-time and volunteer firefighters. Gardiner, MT and Cody and Powell, WY have volunteer fire departments. Powell employs a full-time fire marshall.

Ambulance services are provided by Yellowstone NP, which has advanced life support capability and a helicopter for patient transport. A Search and Rescue Unit in the Cooke City/Silver Gate area provides disaster and emergency services. Livingston and Gardiner, MT both have ambulance service. Privately owned ambulance companies provide services in Cody and Powell, WY.

There is one semi-retired physician in the Cooke City/Silver Gate area who provides medical care on a part-time basis. The area is also serviced by a first responder unit. The Cooke City Emergency Medical Services Squad has six EMTs who provide nontransporting, basic life support, including defibrilation capabilities. The closest full-scale health care is located in Red Lodge, MT, 65 miles from Cooke City via the Beartooth Highway. Heavy snow closes this highway seven months of the year. The nearest year-round health care services are located in Livingston, 109 miles away. There is also an outpatient clinic in Mammoth, 50 miles away. It is staffed and operated by West Park Hospital of Cody, WY and is open to the general public year-round.

Cody offers a wide range of health services with 25 physicians, 10 dentists, a 46-bed, full-service hospital, 24-hour emergency services, and a helipad. Powell has a 40-bed hospital with 24-hour service and about 19 doctors.

Water, Wastewater, and Solid Waste Disposal. Cooke City has a spring fed central water distribution system. The system has a total of 50,000 gallons storage capacity and serves about 80 residential and 122 motel unit hookups. Silver Gate also has a spring fed central distribution system capable of storing 20,000 gallons. It serves about 29 residential and 70 motel unit hookups.

A negotiated water rights agreement between Yellowstone NP and the Montana Reserved Rights Compact Commission was discussed earlier under Surface and Ground Water. This agreement prevents significant expansion of water delivery from existing sources by the Cooke City and Silver Gate systems.

The City of Livingston, MT provides water to its residents through a municipal water system supplied by six wells. Water in Gardiner, MT is provided by the Gardiner-Park County Water District. The Shoshone Treatment Plant near Buffalo Bill Reservoir in WY supplies water to both Cody and Powell by means of the Shoshone Municipal Water Supply Pipeline. This system has excess capacity to meet projected needs through at least 2020.

Wastewater is disposed of in septic tank systems throughout the Cooke City/Silver Gate area. Many of the existing systems are old with failing drain fields or seepage pits. Installation and proper operation of septic systems in the area is complicated by a high water table and spring snow melts which saturate the ground. The capacity for additional drain fields is limited by high ground water, steep slopes, and the floodplain for Soda Butte Creek.

Gardiner is served by an aerated sewage lagoon system operating near capacity. The Cities of Livingston, MT and Powell and Cody, WY maintain sewage treatment systems operating at 33, 50, and 55 percent of capacity respectively.

Park County, MT operates a green box (dumpster) disposal site near Cooke City on Forest Service land permitted to a county-wide disposal district. Yellowstone NP collects solid waste year-round in these communities and hauls it to an incinerator in Livingston. The ash is disposed of in the Livingston landfill, which has approximately two years of life remaining. Incinerator tonnage has increased consistently over the past decade. The district is currently evaluating its options for bringing the system into compliance with state air quality standards.

Park County (WY) Solid Waste District operates four landfills, including one south of Cody and one near Powell. The Cody landfill is situated on BLM land and has an additional eight to ten years of capacity remaining.

Social Services. Social services for Park County, MT are centralized in Livingston. Park County, WY is serviced by offices in Cody and Powell. These offices offer programs such as aid to families with dependent children, food stamps, county medical, Medicaid, and county general assistance. Funding is from federal, state, and county sources. The Montana Department of Family Services covers Park County, MT and offers services such as child protection, investigative services for child abuse and neglect, developmentally disabled programs, and protective services to the elderly. The demand for social services has grown in both counties and agencies report an overload.

Planning. Park County, MT is currently preparing a countywide Comprehensive Plan. A Zoning District was established in the Cooke City/Silver Gate area in 1993. The District has the authority to control most land use activities, but does not have the authority to regulate mining activities. Park County, WY has a Comprehensive Plan prepared in 1980 which is currently being updated. The County is regulated by Development Standards and Regulations adopted in 1995.

Road Maintenance. Park County, MT currently relies on Yellowstone NP to provide road maintenance and plowing for the Cooke City/Silver Gate area. Park County, WY provides snow removal on portions of U.S. 212 and Wyoming 296. WY 296 and U.S. 212 are plowed as necessary within the 40-hour work week. Overtime is only authorized for life-threatening situations. No sanding or ice control is provided.

Electrical Power Supply. Pacific Power provides electrical service to the study area through an existing 14.4/24.9 KV distribution line that runs from Cody, WY to Cooke City, MT. According to Ted Huss, Land agent with Pacific Power, given the current load growth, it may be 5 to 10 years before significant upgrades would be required to the existing transmission line. If a single significant new residential or business customer, such as a mine, requires additional work to the existing electrical system, the new customer would likely be asked to participate in these costs. Costs of construction to a new system, as with other transmission facilities, would not be isolated to a single geographic area but rather spread out over all of Pacific Power's 1.3 million customers, including customers in all other states that Pacific Power serves. Customers in Cooke City would only be required to pick up incremental costs, if any, reflected by the entire system.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

The Cooke City/Silver Gate area currently has little or no infrastructure capacity to absorb growth. The development of the NWP is anticipated. There is a possibility that additional mines could be developed. If additional mines are developed, the magnitude and duration of effects would increase. Added tax revenues and the Montana Hard-Rock Mining Economic Impact Act could fund new services or improve existing facilities or services. However, this would be more likely in Park County, MT than in Park County, WY. Without specific immigrating population residency locations however, it is not possible to determine specific needs. Therefore, a general discussion of the effects follows.

Schools. Population increases could have the most profound effect on the Cooke City school district. Enrollments have fluctuated between five and nineteen students over the last five years. The addition of eight to nine year-round students would require a new school building, an additional teacher, increased administrative costs, and additional supplies.

Most other schools within the study area are also operating at or near capacity. Because of their relative size, they are more likely to be able to absorb some population increases without a great deal of stress. If population increases are evenly distributed over the entire study area, it is possible that schools currently in place could absorb the increased number of students resulting in higher teacher:pupil ratios. However, any concentration of students could easily exceed the capacity of a given school resulting in the need for additional staff, supplies, and administrative services. Student populations exceeding the capacity of current facilities could necessitate the expansion or replacement of those facilities.

Emergency Services. Increased population could result in added demand for the services of the two counties' Sheriff's Departments, Yellowstone NP, and Highway Patrols. Additional personnel, equipment, and office space may be needed to handle the increased workload.

The Cooke City/Silver Gate Fire District could receive an increased number of calls for service due to the population increase and associated increased amount of housing. It is likely that a higher level of service would be needed requiring additional equipment, training, and administrative support.

Because of mining-related truck traffic, and the possibility of hazardous materials being hauled under difficult driving conditions, it may be necessary to form a hazardous material response team in Park County, WY. This would involve costs for personnel, training, equipment, and administration. Such a team could be managed directly by the county or as a division of the fire protection organization.

Ambulance services could continue to be provided by Yellowstone NP, particularly in cases where advanced life support capabilities are needed. If, however, Park County, MT assumes responsibility for emergency services as requested by Yellowstone NP, the area's First Responder unit would need to upgrade to a transporting ambulance service in order to provide an adequate level of service.

Water, Wastewater, and Solid Waste Disposal. The Cooke City/Silver Gate area would have to develop new sources of water to meet the needs of the population growth that would accompany major mining activity. The availability of new water sources within Soda Butte Creek drainage is limited by the Reserved Rights Compact between the United States and Montana.

Increased waste water resulting from population growth and difficulties associated with the septic systems currently in use, could result in the need for development of a sewer system in the Cooke City/Silver Gate area.

Any substantial increase in solid waste could exceed the space available in the 32 cubic yard compactor operated by Yellowstone NP. The domestic solid waste load has risen from just over 150 tons per year in 1989 to more than 300 tons per year in 1993. With the population growth associated with mine development, it is unknown if Yellowstone NP would be able to handle the additional solid waste generated or if Park County, MT would have to take over responsibility.

Social Services. Mining activities could increase demand for social services including public assistance, counseling, and other social support services.

Planning. Additional planning and overall county government administration could be needed in order to provide current services and programs to a growing population. This may result in a need for additional administrative support and associated costs.

Road Maintenance. Mining activities in the Cooke City/Silver Gate area would require increased maintenance and plowing of roads from Cooke City to Cody, Wyoming. Keeping the roads open during the winter months and the potential for mine-related heavy truck traffic would alter the maintenance costs and traffic patterns on the regional road system.

Other. The PIC impact study, contracted by Park County, WY, identified concerns by residents and officials of the county that Crown Butte will not be able to enforce the proposed employment policies that would prohibit most mine employees from locating their residence in the communities of Cooke City and Silver Gate, MT or Sunlight Basin and Crandall, WY. The net effect if these employment policies fail and can not be enforced, would be a larger than anticipated population growth in these communities and in the community of Clark, WY resulting in a substantial increase in the demand for local government and school services in these communities. It was reported that even a very small increase in the community of Clark would necessitate expansion of school facilities.

Additionally, Park County, WY would not benefit from tax revenues resulting from the operation of a mine in Park County, Montana and would not benefit from the requirements of Montana's Hard-Rock Mining Impact Act. Crown Butte Mines had indicated a willingness to compensate Park County, WY for capital expenditures necessitated by the impacts of the New World Project. However, the assumption cannot be made that other companies initiating operations in the New World Mining District would do the same. The same concern was raised relative to reimbursement of the Wyoming School Foundation program for expenses related to the education of mine related student populations. Concern was also raised relative to increased maintenance costs of US 212, WH 296/120. There is nothing to require a mine operator to reimburse the Wyoming Department of Transportation for these costs.

Areas of major cumulative concern would include schools and public protection/safety. The effects of mining could occur throughout the study area, but could be most severe in the Cooke City/Silver Gate vicinity when added to the effects of other potential growth and development.

Year-round access between Cooke City and Cody, WY would increase the level of recreational/tourist traffic introduced into the area during the winter months. Such an increase in tourism would necessitate increased economic activities in the service sector during the winter months. The personnel required to provide those services would also add to the demand for community services and infrastructure discussed above.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

The NWM Agreement would significantly reduce the potential for mine development. The area of highest potential is no longer available for development. The NWP would not be developed. The potential for mining related changes to community services and infrastructure is low.

There is a 1:50 probability of an underground mine on federal and private land not included in the NWM Agreement. If such a mine is developed, the effects described above under Scenario A-1 could occur. Cumulative effects would also be the same.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Due to anticipated development, including the NWP, on private land and unpatented mining claims in the central portion of the study area, impacts described under Scenario A-1 would also occur under this Scenario. The only difference is that the probabilities for each projected mine's development are slightly lower.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

In the event that the NWM Agreement is implemented, the community service and infrastructure effects associated with mine development would not occur.

Housing

Affected Environment

The U.S. Bureau of the Census (1990) reported that Park County had 6,926 housing units. About 54 percent were owner-occupied, while 27 percent were renter-occupied. Nineteen percent were considered vacant. Most of the vacant housing is attributable to recreational homes. There were 277 housing units in the Cooke City/Silver Gate area. About 22 percent were occupied on a year-round basis. Seventy-eight percent of the homes were classified as vacant with a majority of those (70 percent) being recreational homes. Eighty-seven percent of the total number of housing units were one-unit structures and 4.3 percent were mobile homes.

Year-round housing in the Cooke City/Silver Gate area is very limited, particularly with respect to rental units. Some summer residents reside in local motels. A telephone survey of 12 local motel and cabin rental unit owners by Crown Butte in 1991 revealed that half do not remain open year-round because tourist activity was too slow, their building was not equipped to withstand the winter temperatures, or they could not make money during the off-season months.

The 1990 Census reported 10,306 year-round housing units in Park County, WY. About a third of those were located in Cody and about one-fifth in Powell. About 70 percent of the occupied housing units in Park County were owner-occupied, while the remaining 30 percent were renter-occupied. Homes are generally selling very well in Park County. The availability of both purchase and rental housing is tight.

Environmental Effects

Effect of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

If the mines projected were developed, each would create an associated increase in the demand for housing. Using the estimated housing demand projected for the New World Project as an example, each mine could result in a demand for 200 or more homes to house the direct and indirect workforce. Because these mines are not projected to operate at full production concurrently, the resulting demand for housing would be spread out over the 20-year period. Although overlaps in the operating periods for these mines are likely, the extent of those overlaps and their precise effects on housing demand cannot be accurately determined.

The need for these homes could be spread over the study area. However, specific residency patterns cannot be predicted. Housing throughout the study area has been in consistently short supply in recent years. The lack of housing could be most evident in Cooke City and Silver Gate where the potential for new housing is limited by sanitary restrictions on septic tank development and high ground water. Privately owned tracts between Cooke City and Silver Gate have the highest potential for new housing in the immediate area of any potential mining activity.

The increased demand resulting from a new mine would put upward pressure on prices for the purchase or rental of properties. Because of their relatively high wages, mine personnel could be in the best position to obtain housing compared to workers moving in to take service jobs.

Because of the limited ability to expand infra structural support and services in the Cooke City/Silver Gate area, it is likely that greater pressure would be placed on the housing markets of other communities.

Non-mine related population growth and the associated increase in housing demand would continue, resulting in a need for an estimated 270 additional housing units or more within the two county area. Since housing development often lags behind demand, housing could continue to be in short supply resulting in increased housing costs.

Should the mines projected above be developed, mine workers and indirect service workers would add to the existing and projected future competition for reasonably priced single family and rental units. This could occur throughout the study area, but could be most severe in the Cooke City/Silver Gate area. Given the cumulative shortage of homes and rental units, it could be more difficult for existing residents to upgrade their living conditions. There could also be additional pressure to provide lower income housing or manufactured homes that may be of lower quality and/or located in inappropriate places.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

In the event that the NWM Agreement is implemented, the effects described in Scenario A-1 above could still occur. The probability of a mine being developed is 1:50. The cumulative effects described for Scenario A-1 would also occur under this Scenario.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

If the NWM Agreement is not implemented, the NWP would be developed and there are lower probabilities of additional mines. Therefore, the effects described under Scenario A-1 would occur under this Scenario also.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Projected housing demand by workers associated with mining would not occur. The cumulative effects described under Scenario A-1 would also occur under this Scenario.

Conclusion

Under Scenario A-1, if mining occurs, individual communities would face major impacts depending on the residency patterns adopted by inmigrating workers. Communities most likely to face major effects are Cooke City and Silver Gate. Population impacts on the entire study area could range from less than 1 percent to 3 percent of the combined populations of Park County, MT and Park County, WY. The effects felt in the communities of Cooke City and Silver Gate could be profound. The infrastructure in these communities has little or no room to absorb growth. Therefore, a major expenditure of funds by Park County, MT government and other local jurisdictions would be required in order to provide an adequate infrastructure and services to inmigrating populations. Even with such a commitment of funds, physical and weather restrictions present significant barriers that must be overcome. A housing shortage would require a commitment of funds and land resources to meet housing needs. The mining activity forecast under this Scenario could alter the social character and quality of life in these communities. There could be a loss of some social and cultural values and breakdown or transformation of existing social structures for some people. The magnitude and location of these changes and their effects would depend on individual and/or group values, goals, beliefs and expectations, and on the willingness and ability of people to adjust to change.

In the event that the terms of the NWM Agreement are realized under Scenario A-2, there is a much reduced likelihood that the effects described under Scenario A-1 would occur. If a single mine were developed, the effects described above could occur but for a shorter length of time and at a lessor magnitude. However, a mining operation would have a profound effect on the communities of Cooke City and Silver Gate.

The effects described under Scenario A-1 could also occur under Scenario B-1, although there is a slightly lower probability that the mines projected would be developed.

With Scenario B-2, no population changes due to mining would be anticipated. No immediate changes would be needed in terms of community services and infrastructure, except as required by the growth in recreation use and tourism. Social structures and quality of life would be maintained, with a gradual easing of tensions between pro- and anti-mining groups and individuals.

CULTURAL RESOURCES

Substantive Changes between the Draft EIS and the Final EIS

At the end of the Introduction a paragraph was added to disclose that the Montana State Historic Preservation Office (SHPO) concurs with the analysis and conclusions on the potential effects to cultural resources described in the DEIS.

A statement was added to the "History" section to acknowledge that mining occurred in the Cooke City area outside of the historically significant mining eras discussed in that section. A similar statement was added in the section describing the open mining era of 1934-1942.

In the discussion of the effects of Scenario A-1 a statement was added to indicate that surface disturbance would likely be greater with the development of an open pit mine than an underground mine.

In the discussion of the effects of Scenario A-2, the disclosure of effects to cultural resources was modified to more accurately indicate that, in general, the lands that would remain available for mineral entry under this Scenario are outside of the New World Historic District. Therefore the anticipated effects would be less significant than those projected for Scenarios A-1 and B-1.

At the end of the discussion of effects of Scenarios B-1 and B-2, a statement was added to indicate that if mineral development occurs on private land or on existing unpatented mining claims, the withdrawal may limit facility siting to lands with a higher concentration of cultural resources.

In the discussion of effects of Scenario B-2, the statement that this Scenario would have an overall beneficial effect on the historic district and sites was modified to indicate that these resources are not likely to be affected by future mining.

Introduction

Significant cultural resources include historic and prehistoric properties that have been listed on, or evaluated as eligible for listing on the National Register of Historic Places (NRHP). Prehistoric properties refers to sites occupied prior to significant European contact. Historic period properties refers to sites occupied after European settlement.

A number of laws and regulations protect cultural resources on federal lands. Beginning with the Antiquity Act of 1906, they also include the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act (ARPA), the American Indian Religious Freedom Act (AIRFA), the Native American Graves Protection and Repatriation Act (NAGPRA), and the federal regulations, 36 CFR Part 800, Part 60 and Part 79.

Guidelines for identifying and protecting cultural resources are given in Section 106 of the NHPA and the implementing regulations, 36 CFR 800. Section 106 requires federal agencies to take into account the effects of their undertakings on significant cultural properties. Significance is defined as being on or eligible for the NRHP. Eligibility for the NRHP is based on the degree to which a property possesses "integrity of location, design, setting, materials, workmanship, feeling, and association", and

(a) are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) are associated with the lives of persons significant in the past; or

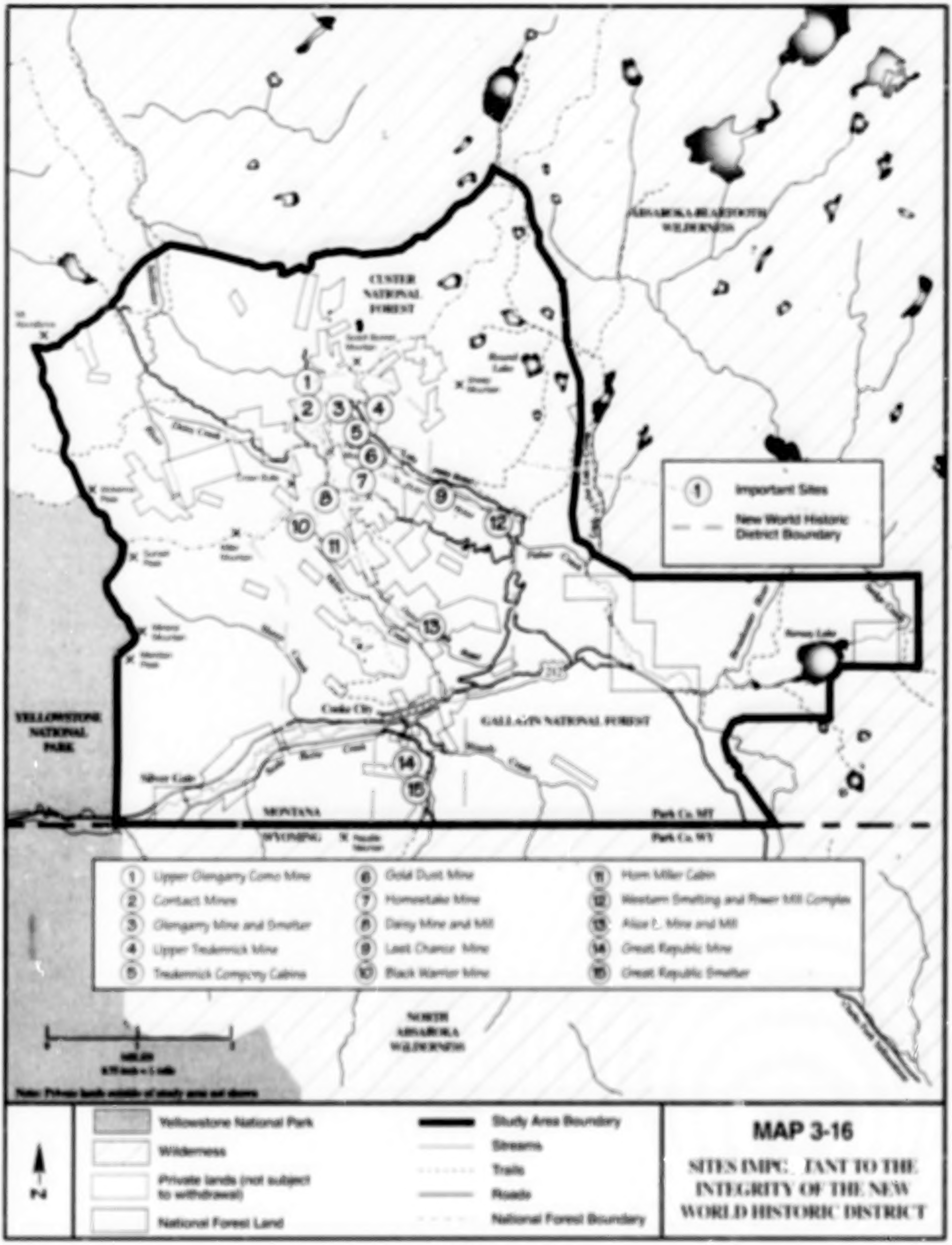
(c) embody the distinctive characteristics of a type, period, or method of construction; that represent the work of a master; that possess high artistic values; that represent a significant and distinguishable entity whose components may lack individual distinction, or

(d) have yielded or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

36 CFR 800 regulations also require the federal agency to receive comment on project proposals from the State Historic Preservation Office (SHPO). The Montana SHPO (letter, March 18, 1997) concurred with the analysis regarding the potential effects to cultural resources in the DEIS. SHPO concurred with the assessment that the mineral withdrawal, combined with the NWM Agreement, appears least likely to adversely effect cultural resources.

Affected Environment

The study area has been used historically for mining since the late 1860's. Because of its' mining history, setting, and integrity, the area has been listed as the New World Historic District (District) under the National Register of Historic Places. Map 3-16 depicts the boundaries of the District, which is approximately 6,480 acres.



MAP 3-16

SITES IMPORTANT TO THE INTEGRITY OF THE NEW WORLD HISTORIC DISTRICT

The study area also contains other historic and prehistoric resources. There are 14 known prehistoric sites within the study area, 7 of which are significant under criterion d above. There are 83 recorded historic sites in the study area; 43 are significant and contribute to the District. Seven prehistoric and 24 historic sites are on federal land. The remainder are on private land. Individual historic sites within the District are significant under criteria a,b,c, and d listed in the Introduction. (NWP PDEIS, Chap 10.)

The District is an example of a hard rock mining area showing various forms of metal mining, mine technology, and design (Ferguson 1996: 1). Remains in the District have the potential to add information about the District's history and may more clearly present a picture of the daily lives of its occupants. Events and persons associated with the development of the District have affected local and regional history (Ferguson 1996: 8.12).

Approximately 3,900 acres have been inventoried for cultural resources in the study area. The largest inventory was carried out by GCM Services between 1989 and 1990 as part of the New World Project environmental impact analysis (GCM 1990: 1). The investigation included background literature search of the New World Mining District and intensive field survey of over 2,500 acres concentrated in and around the site of the proposed New World Project. This large, intensive investigation provides information to understand the past occupation of the study area.

The Custer National Forest (NF) carried out a cultural resource probability modeling study as background analysis for the Beartooth Oil and Gas EIS (Custer 1996: 3.39). The modeling study included 5,750 acres of Custer NF within the study area including Daisy Creek and headwaters of the Stillwater River. The study indicates that about 80% of the 5,750 acres is "high probability" for site occurrence.

In addition to data from cultural resource work in the study area, information from adjacent locations sheds light on the prehistoric and historic occupation of the region. This information shows a long and diverse human occupation spanning the last 12,000 years. The most common prehistoric site type in the study area is the lithic scatter and the most common historic site type is related to mining activity.

Prehistory

The study area, in the higher elevations of the Beartooth Mountains, participated in the prehistoric cultural development which characterizes south central Montana and adjacent Wyoming. This region supported a long series of occupations by small, mobile hunting-gathering groups who entered the area about 12,000 to 10,000 years ago (Custer N.F. 1996: 3.36).

The first peoples, called Paleo-Indian, hunted now extinct mammoth and bison utilizing distinctive lanceolate projectile points. The earliest Paleo-Indian materials, the Clovis culture complex, is best known from a Plains setting. Apparently Paleo-Indian groups in the Beartooth and Absaroka Mountains developed a mountain adapted culture characterized by the hunting of mountain sheep (Husted 1969; Frison 1991). Sites near Red Lodge and at Mystic Lake, as well as surface finds from locations adjacent to the study area indicate use of the region during this time (Beckes and Keyser 1983: 318; GCM 1990: 19-23).

A climatic shift characterized by warm, drier weather (the Altithermal) began in this area as early as 9,000-9,500 years ago (Cannon 1996:1). With it, a shift in subsistence strategies toward the use of a wider variety of animal and plant resources occurred. Archaic is the term given to the cultural stage associated with these changes. The Early Archaic is associated with the Altithermal, which may have caused reduced occupation of the Plains and increased occupation of the mountainous regions, including the Beartooths. Based on the occurrence of Early and Middle Archaic points in the high mountains north of Yellowstone NP, Haines postulates that park-like areas and high ridges above 8,900 ft. were more habitable during the Altithermal than the lower elevations (Haines 1963: 13). Recent analysis of surface collections from the Beartooth Mountains north and east of the study area indicates that about one-third of the projectile points are Early Archaic, suggesting a more intensive occupation of the Beartooths during that period than any other (Husted 1992b: 2). Early Archaic side notched points were found above 9,600 ft. within 15 miles of the study area and one possible Early Archaic point was recovered from the study area (GCM 1990: 20).

Middle Archaic materials found in alpine and subalpine zones in the Beartooths suggest that small groups of foragers utilized the mountain meadows and canyons (GCM 1990: 22; Haines 1963; Husted 1992b; Beckes and Keyser 1983: 332), but no identifiable remains of this period have been found in the study area. A variety of topographic settings, including mountain valleys, creek sites, and high divides in the Absaroka-Beartooths have produced Late Archaic remains (Custer 1996: 3.36). Evidence of subsistence specialization on mountain sheep is found in Late Archaic sites in northern Wyoming (Puckett 1983: 9). Late Archaic projectile points have been surface collected in the vicinity of the study area. One Pelican Lake point and several fire hearths in the study area appear to represent a Late Archaic campsite.

The Late Prehistoric/Protohistoric period is a time of significant technological change, increased population movements and social interaction. The Late Prehistoric begins about A.D. 500 with the introduction of the bow and arrow (Frison 1991). Communal procurement of large game animals such as bison, antelope, and mountain sheep reached a high point. A number of the lithic scatters in the study area are of this period.

Shoshone peoples moved into the area from the southwest beginning around A.D. 1400. About 1700, the Crow came in from the east (Beckes and Keyser 1983: 116, 337). Horses were introduced to Plains hunting groups by about 1725 and by 1775 most groups had a fully equestrian adaptation. Although the Shoshone were apparently the first Northwestern Plains group to acquire the horse, one branch of Shoshone, which early accounts put in Yellowstone NP and the Beartooth Range, lacked horses and guns and lived in brush and pole shelters called wickiups (Custer 1990: 3.36; Chittenden 1964; Glidden 1976: 83). Called Sheepeaters because mountain sheep were a main source of food, this group is thought to be a mixture of Shoshone and Bannock. These peoples left the Park in the 1870's to join the Shoshone on the Wind River Reservation in Wyoming.

History

The New World Historic District was established to protect the historic resources associated with mining from 1869 to 1942. The dates for each mining period listed below represent the historically significant mining eras identified during the National Register of Historic Places nomination process. Mining activity occurred outside these periods, but these periods were most significant from a historical context. The District consists of 83 historic properties, of which 43 contribute to its designation as a National Register District. The 43 contributing sites consist of towns, mines, mills, smelters, cabins and other mine features.

Pre-mining. The first white men in the project area were fur trappers and traders who explored southwest Montana during the later part of the 1700's and the 1800's. The first trapper-trader who can be placed with certainty in the study area is John Colter, who traveled through there in 1807. Colter Pass, named for him, is on the northeast side of the study area (Glidden 1976: 63; Chittenden 1964: 22-23).

Several annual fur trading rendezvouses were held in and around the Yellowstone NP area, including the study area. The trapper-trader Jim Bridger was in the Park area between 1841 and 1844 and probably the study area also (Chittenden 1964: 47).

Initial Prospecting (1869-1882). Gold discoveries in the 1860's in such places as Last Chance Gulch in Helena and Alder Gulch in Virginia City brought hundreds of prospectors to southwest Montana in search of riches. Many of the men were former trappers turned prospectors and the study area was one of the places they searched. The first mineral discoveries in the area were made by four such men who, in 1869, fleeing raiding Indians, crossed from Cache Creek into the Republic Creek drainage. They discovered the manganese outcrop on Republic Mountain which was later developed into the Great Republic Mine.

News of the discoveries spread like wildfire as newspapers both in Montana and on the east and west coasts picked up the stories. But since the area was part of the Crow Reservation, capital for substantial investment could not be raised. Still, individuals searching for riches came and by 1875 a small settlement had been established on Soda Butte Creek to supply them. A small "roasting furnace" was built there. This furnace was destroyed in 1877 by a Nez Perce raiding party when Chief Joseph fled through the area. The furnace was burned and lead ore taken by the Nez Perce to make shot.

A major problem in the development of the mining properties and the settlement was the lack of adequate transportation. Since only pack trails connected the area to the outside, transportation costs added so much to the overall costs of production that the mines were often barely profitable. To solve this problem, local people tried to interest Jay Cooke, Jr., son of the Philadelphia financier and a backer of the Northern Pacific Railroad, in bringing a spur line into the town. The townspeople even voted to name their settlement Cooke City in honor of the investor. However, financial problems prevented Cooke from constructing the spur and the area still lacked adequate transportation.

Development of the ore deposits was also held back by the fact that the area was part of the Crow Reservation. In 1882, pressured by demands of the Cooke City miners as well as ranchers in the Yellowstone River Valley, the government reduced the size of the reservation and the area was thrown open for settlement. People poured in and the New World (NW) Mining District was established.

Transportation continued to be a problem, but in 1882 a wagon road was pushed through the mountains from Gardiner. In 1884 another wagon road was built down the Clark's Fork to connect with the road between Lander and Red Lodge.

Development of the Mining District (1882-1894). The period 1882-1894 was very active for the NW Mining District, with mineral exploration spreading to all parts of the area. This surge in prospecting led to many discoveries which were quickly developed as patented mines. Soon 1,450 claims were recorded in the NW Mining District

(Wolle 1963). Most of the named mines were opened in the first half of the 1880's. Some uncovered substantial lodes which continued to be worked for many years. The richest finds of this period were in the north-central part of the area - on Scotch Bonnet, Fisher and Henderson Mountains, at Lulu Pass, and upper Fisher Creek. By 1890, 259 additional claims had been filed on Henderson, Scotch Bonnett, Crown Butte, and Fisher Mountains (Ferguson 1994).

Meanwhile, Cooke City continued to grow. It is estimated that the population hit a peak of about 1,200 people in 1886. Residents renewed efforts to bring a railroad to town, but again failed. The countryside around Cooke City was being settled too. Beginning in the 1880's, farms and ranches provided food and supplies to the mines and community. One of these homesteaders was Enos O. Kersey, for whom Kersey Lake was named (Glidden 1976: 97).

The remaining physical evidence of this period is extensive. Many of the 37 historic sites identified by the GCM survey have remains dating to this period. Many sites include not only the evidence of mineral extraction—adits, stamp mill, assay office, etc.; but also the evidence of domestic activities, such as boarding houses, tent camps, stables, and trash dumps.

In 1893, events far distant from Cooke City caused the virtual cessation of mining activity in the district. In that year silver prices dropped and the nation experienced a recession. By 1894 most of the mines were closed.

Reorganization and Resurgence (1910-1930). The second period of mining activity began when copper was mined in the area of Goose Lake and Goose Creek, the northern boundary of the study area. While the prior period of mining in the district can be characterized as one of individual prospecting, this period can be viewed as that of the promoter. The leading promoter of New World mining property was "Doc" Tanzer, who acquired claims on Henderson, Scotch Bonnett, and Sheep Mountains and began promoting these operations throughout the United States and in Europe. Tanzer's vision was to have an integrated operation to accomplish all phases of mineral extraction. To that end, beginning in 1915, the company, Western Smelting and Power Company, built a 250 kilowatt hydroelectric plant on the Clarks Fork River to provide power for all of its operations and constructed a 350 ton copper smelter on Fisher Creek. Believing that the Homestake Mine ore body at the top of Henderson Mountain extended down through the mountain, Tanzer opened the Gold Dust Mine 700 ft. lower to intersect this zone. An aerial tramway was built to connect the Homestake adit with the Gold Dust adit, continuing on to the smelter two miles away.

These constructions completed, investors in the company awaited discovery of the ore body in the Gold Dust. As that adit was pushed farther into the mountain without evidence of the lode however, it became increasingly clear that the ore body would not be located. The collapse of the stock market in 1929 and resulting financial panic proved to be the undoing of the company and of "Doc" Tanzer as well. In 1929, Tanzer disappeared, resulting in the complete shutdown of the operations and the abandonment and deterioration of the smelter, hydroelectric plant and the other company constructions.

Remnants of aerial tramway in the Fisher Creek drainage.

Many of the other, smaller companies operating during this period also focused on copper ore. Two of the better known of these, the Glengarry Mining Company and the Tredennick Development Company, lost their financial backing after the stock marked crash of 1929 and were abandoned by 1930.

Most of the historic remains in the district are from this second period. They include the numerous structures, tramline, power plant, and smelter of the Western Smelting and Power Company. The Glengarry Mine had an associated tent "city" called Glengarry City. Small smelters were associated with a few mines.

Predominately Open Pit Mining (1934-1942). This period saw much less activity than the earlier ones. Mining that occurred was predominately open pit mining. The New

Year's Gift Mine on Fisher Mountain, opened by the McLaren Gold Mines Company, produced mainly gold and silver. The Black Warrior, Upper Glengarry-Como, and Alice E. mines also operated at this time. Although mining activity continued in the area, this historical period ended in 1942 when gold mining was deemed a nonessential wartime activity and the labor force turned to the WWII effort. Some structures remain at the above sites, but forest fires in 1988 destroyed those at the Alice E. mine.

Development of the Recreation Industry. The development of the recreation industry in this area is in part due to the natural scenic qualities of the district itself and in part to its location adjacent to Yellowstone NP. Although mining was Cooke City's economic mainstay during the early 1900's, the recreation industry, which would later replace it in economic importance, began during this time. In 1919, guided horseback trips were offered out of Cooke City. Grasshopper Glacier, between Cooke City and Red Lodge, was a favorite spot to visit (Hansen 1962: 16).

Many places of grandiose and unspoiled nature could be found around Cooke City and the district's inaccessibility made it even more attractive to those tourists who were able to reach it. However, the development of recreation as an economic mainstay really only began after the construction of the Beartooth Highway from Red Lodge to Yellowstone NP. Interest in a highway "across the top" goes back to shortly after the turn of the century, when a Red Lodge citizen's group championed the tourism benefits of the scenic eastern approach to Yellowstone NP. Following several years of lobbying disappointments, the biggest boost came in 1925 when Montana Congressman, Scott Leavitt, attached the proposed route as an amendment to his Park Approach Act. In 1931, the bill was signed into law and funding for the highway was approved (James 1995: 21-23). The highway was constructed between 1932 and 1936 following, in part, trails blazed by trappers over a century earlier.

Traditional Cultural Properties

The American Indian Religious Freedom Act (PL 95-341) requires that federal agencies consider the effect of their actions on American Indian traditional uses. To do this, federal land managers notify the appropriate Indian tribe in advance of upcoming projects and seek comment on the effect of the project on traditional cultural properties, if any, in the analysis area.

While several tribes may have used the study area in the past, the Shoshone and Crow are known from historic records to have occupied the area (Beckes and Kayser 1983; Chittenden 1964; Glidden 1976). The last Shoshone left the area in the 1870's to reside on the Wind River Reservation in Wyoming. The study area was part of the Crow Reservation until 1882.

The Crow, Shoshone, Shoshone-Bannock, Arapaho, and Northern Cheyenne tribes were consulted regarding the potential presence of traditional cultural properties in the study area. No traditional properties were reported.

Environmental Effects

Kinds of Effects

According to 36 CFR 800.9(a) an undertaking "has an effect on a historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register of Historic Places." An effect may include an alteration to the property's characteristics of location, setting or use. 36 CFR 800.9(a) defines adverse effects as follows: "an undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association". Adverse effects include, but are not limited to:

- physical destruction, damage or alteration of all or part of the property,

- alteration of the character of the setting when that character contributes to the property's qualification for the National Register,

- introduction of visual, audible or atmospheric elements that are out of character with the property or alter it's setting.

A direct effect occurs when the action of the undertaking itself impacts the cultural resource. For example, a road or other construction which demolishes or damages a site. An indirect effect is not caused by the action itself but is the secondary result of the undertaking. An example would be a new road which allows public access to previously secluded cultural resources and which results in artifact collection or damage of structures at the site due to increased public visitation. Cumulative effect refers to the impact of more than one undertaking on the cultural site.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for *mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.*

Surface disturbing activities could include exploratory drilling, adit excavation, gravel extraction, the construction of associated mining facilities and camps, construction of access roads and powerlines, disposal of waste debris, etc.. The seven known significant prehistoric campsites in the study area are all on federal land. There is a high likelihood of impact to these resources because of their proximity to areas of likely mineral development and associated facility construction (Walt Allen, personal communication, 1996). Direct effects could be physical damage from road construction, mineral exploration, mine development, and the construction of related mine facilities and camps. If an open pit mine were developed, surface disturbance would typically be greater than disturbance associated with an underground mine. The cultural resource laws mentioned above require mitigation of the impacts of projects such as these on significant sites. Mitigation could include changing the location of impacting activities or data recovery through archaeological excavation and could reduce the effect of data loss from mining related activities.

The 24 significant historic sites on federal land are known to include properties from the first and second periods of mining activity in the District. The Gold Dust Tram Line and parts of the Western Smelting and Power Company complex are among these. Mineral exploration and subsequent mining activities could cause adverse effects to these properties individually and to the District.

In addition to the effects of physical damage are the effects to the historic character of the District. Character of setting of the District comes from the isolation, placement of the structures within the landscape, terrain, topography, and other features of the land. Whereas more of the significant individual historic sites are on private lands, the federal lands provide a great deal of the District's character of setting. Future mining could result in direct effects to the character and integrity of the District. Examples might be impacts from the introduction of modern mining constructions such as impoundments, powerlines, buildings and facilities which cause visual and audible elements out of keeping with the setting.

Mitigation by data recovery addresses the physical damage to the sites. Impacts to the character of setting and the integrity of the District are more difficult to mitigate but might include efforts to blend the facilities into the surrounding terrain, for example. The degree to which these mitigation techniques would succeed depends in large part on the size and nature of the mining facilities and their location in relation to the historic properties.

Indirect effects of Scenario A-1 would probably also occur and could, over time, result in almost as much damage to the cultural properties as the immediate direct effects. These indirect effects would impact both prehistoric and historic sites. For example, roads which are initially constructed for geophysical exploration and mining could provide access to currently secluded cultural sites, exposing them to artifact collection and damage from vandalism.

The New World Project. The proposed New World Project (NWP) serves as an example of mining-related effects that could occur to cultural resources. The area of potential effects of the NWP overlap approximately two-thirds of the New World Historic District. The overlapping portion contains most of the historic sites which contribute to the District and all but one (the Alice E. Mine and Mill) of the sites which are listed as important to the integrity of the District in the NWP PDEIS, Fig. 10-1, 10-2.

The NWP PDEIS (Chapter 2) lists eight possible mine alternatives. Two of these would physically affect three or four prehistoric sites. Mitigation by data recovery (archaeological excavation) would reduce the effects.

Three of the eight mine alternatives would adversely affect significant historic sites (Gold Dust Mine, Gold Dust Tram, Western Smelter and Power Mill Complex, Tredennick Company Cabins, Glengarry City). These alternatives would substantially change the characteristics of location, setting, feeling and the association of the sites. Affected sites would no longer be eligible for the National Register of Historic Places.

These three mine alternatives would also adversely affect the Historic District to such an extent that the historic integrity of the District would be destroyed; the District would no longer be eligible for listing on the National Register. The main adverse effect from these three mine alternatives would come from a large tailings impoundment and other mine facilities which would be located in Fisher Creek. Fisher Creek contains a large number of historic sites that contribute to the overall setting and feeling of the District. With a large impoundment and other facilities in Fisher Creek, the District would no longer be able to convey a sense of time and place, or to represent a historic period (NWP PDEIS, Chap 10, pg. 8,9).

The other five mine alternatives would indirectly affect significant historic properties (Gold Dust Mine, Black Warrior Mine, Horn Miller Cabin, Glengarry Mine and

Smelter, Upper Tredennick Mine). With mitigation, however, the intrusion of these historic resources would not affect the characteristics of location, setting, feeling or association so much that they would loose their eligibility for the National Register (NWP PDEIS, Chap 10, pg .7).

These five mine alternatives would also cause indirect effects to the Historic District. These alternatives would reduce the integrity of the District but would not destroy it. Under all of these alternatives except the Off-Site Tailings Disposal Alternative, a large tailings impoundment would be within the Historic District but not in Fisher Creek. Even so, the District would continue to convey a sense of time and place and to represent a historic period. Therefore the integrity of the District would remain.

If additional mines are developed, there is an increased risk of effects on cultural resources. Future mining activity is most likely where skarn and porphry overlap (Mineral Forecast, Appendix B), which is the core of the Historic District.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

The NWM Agreement helps protect individual cultural resources and the integrity of the New World Historic District. The 1,700 acres of private mineral interests and the 4,180 acres of unpatented mining claims form the heart of the District, containing many of the sites that contribute to the District. As the area of highest mineral potential is no longer available for mining, the mining-related risks to cultural resources would be reduced and the setting of the area would more likely be maintained.

17,760 acres of federal land remain available for mineral entry. In general, the lands that remain open to mineral entry are outside the New World Historic District. If an underground mine is developed, the effects could be similar to those described above for the New World Project under Scenario A-1. The effects would vary depending upon the size and location of a future mine. However, since much of the historic district and many of he significant sites would be protected by the NWM Agreement, the anticipated effects would be less than those anticipated for Scenario A-1 and B-1.

Federal lands available for facility siting under this alternative may help mitigate potential effects to cultural resources on private land. Whereas inventoried cultural resources are concentrated on private lands, facility development on nearby federal land may avoid or lessen impacts to cultural resources on private land.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1, New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

Under this alternative, 17,760 acres of federal land would be excluded from mineral entry; cultural resources on these acres would escape the impacts associated with mining. In general, the lands immediately subject to the withdrawal are outside the New World Historic District. Much of the federal land within the District has unpatented mining claims, so the withdrawal does not have an immediate effect on these lands.

The integrity and character of setting of the District would likely be affected by future mining including the New World Project. Without the NWM Agreement, unpatented mining claims on federal lands and private land available for mineral development, including the area of highest mineral potential which covers the heart of the New World Historic District. The potential effects of mining would be similar to those outlined under Scenario A-1. Briefly, two of the mine alternatives would directly affect significant prehistoric sites and three other mine alternatives would directly affect significant historic sites to such an extent that the integrity of the District would be destroyed. Other mine alternatives would indirectly affect significant historic sites, reducing the integrity of the Historic District but not destroying it.

If development occurs on private land or on existing unpatented mining claims, the withdrawal may result in facility siting on available private lands, which have a higher concentration of cultural resources.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

The combined effects of the NWM Agreement and the mineral withdrawal significantly reduce the potential for future mining in the area. The integrity of the New World Historic District and of individual cultural sites would not likely be affected by future mining.

2,420 acres within the study area would remain privately owned and 60 acres of federal land would still be subject to mining claims with valid existing rights. Mineral exploration and development on these 2,480 acres has some potential to affect historic and prehistoric sites on federal land. However, more than half of the private land is outside the New World Historic District. There is some possibility that the character or setting of the District could be impacted by mining activities on these 2,480 acres, but the potential effects would be much less than the potential intrusions which might be anticipated under the No Action alternative.

Cumulative Effects Common to Both Alternatives

Reclamation

Reclamation is anticipated under all Scenarios due to reclamation associated with mine development or with the NWM Agreement which includes provisions for reclamation activities on historic mine waste. Cleanup of historic mine waste has the potential to affect qualities important to the historic integrity of many sites. Reclamation would probably include the closing of portals and adits, recontouring of mine wastes, liming and revegetation and perhaps more. These activities would probably be concentrated at sites in the Fisher Creek and Daisy Creek drainages. The Como and McLaren pits would be reclaimed; the Glengarry, Gold Dust, Little Daisy, and other adits would be closed; several prospecting pits in the Fisher Creek and Daisy Creek drainages would be reclaimed; tailings piles in Fisher Creek and Miller Creek drainages would be reclaimed; and abandoned roads on Henderson Mountain would be recontoured. Most of the properties and locations to be reclaimed are significant historic sites or locations so there could be an adverse effect from the reclamation activities. Specific rehabilitation plans would need to be reviewed under the Section 106 process of the NHPA and a treatment plan for the protection of significant historic values developed in consultation with the State Historic Preservation Office and the Advisory Council on Historic Preservation.

Highway Improvements

Several highway improvement projects in the next few years could have cumulative effects on the area, although the effect on cultural resources may not be great. Road improvement in Yellowstone NP may require aggregate sources outside the Park. Aggregate sources are excluded from the provisions of the proposed mineral withdrawal, so even if the withdrawal occurs, aggregate locations may be impacted by gravel extraction. Aggregate locations on federal land would need to be surveyed for the presence of prehistoric and historic sites.

The Federal Highway Administration proposes to improve the Beartooth Highway (U.S. 212) from Yellowstone NP east to the Montana/Wyoming State line. This highway parallels much of the southern end of the Historic District and passes through a southern extension of the District. Inventories of the areas of proposed highway improvements indicate that no cultural sites would be affected by the construction (Walt Allen, personal communication, 1996).

Recreation, Tourism, Population Increases

Tourism and recreation in Yellowstone NP and the adjacent federal lands will likely increase. The extensive network of new and old mining exploration roads in the study area is used year round for dispersed recreation. The effects on cultural resources of recreational activities, such as snowmobiling, trail biking, skiing, and hiking may not be as immediately noticeable as that of mining but the continued increasing pressure of recreational use often causes damage to cultural sites. The cumulative effects, especially if vandalism occurs, could be great. The impacts might be mitigated by a monitoring, signing, and educational effort in the area.

Potential population increases, especially around Cooke City, Silver Gate, and US Hwy 212, could result in the demand for more housing, services and infrastructure. Construction could have an impact on historic structures and prehistoric sites.

Conclusion

The potential future mining which might occur under Scenario A-1 affects significant historic and prehistoric sites in the study area. Also, future actions could affect the integrity of the New World Historic District. Impacts could include physical damage to the sites, impact to the character of the setting of the District and the introduction of visual and auditory elements out of keeping with the District. Future undertakings, including reclamation, would need to be reviewed under Section 106 of the NHPA. Mitigation of potential impacts could reduce or eliminate adverse effects to the integrity of the District and to significant sites. Any loss of these resources, however, would be an irreversible commitment of resources. Scenario A-2 reduces the potential for mining in the heart of the Historic District due to the NWM Agreement. While the integrity of the District as well as individual sites are not likely to be affected by mining, mineral development could occur on the remaining federal and private lands available for mining.

For Scenario B-1, the effects on the Historic District and to individual sites are similar to those described for Scenario A-1. The NWP would be developed and other mines are possible in the heart of the District. Under Scenario B-2, the District's integrity as well as historic and prehistoric resources are not likely to be changed because the likelihood of future mining would be significantly reduced. Still, reclamation activities conducted as part of the NWM Agreement would need Section 106 review and mitigation of any possible adverse effects. Loss of cultural resources would be an irreversible commitment of resources.

If development occurs on private land or on existing unpatented mining claims, the withdrawal may result in facility siting on available lands, which in the central part of the study area have a higher concentration of cultural resources.

WILDLIFE AND SENSITIVE PLANTS

Substantive Changes Between the Draft EIS and the Final EIS

In the discussion of threatened and endangered species, a statement was added to indicate that the U.S. Fish and Wildlife Service concurred with the Determination of Effects to federally-listed threatened, endangered, and candidate species described in the Biological Assessment.

The reference to and delineation of Grizzly Bear core areas was clarified to indicate that these are "potential" core areas which have not yet been formally established in the study area. This change appears in the Affected Environment-Grizzly Bear, Map 3-17, and in the discussion of effects for each Scenario.

A statement was added to Scenario B-2 (Grizzly Bears) to indicate that an anticipated increase in use of currently low-use trails could lead to a cumulative reduction in bear habitat.

A statement was added to the Affected Environment (Gray Wolf) to indicate that the absence of cattle and domestic sheep grazing in the study area reduces the likelihood of conflicts that could result in wolf mortality and/or hinder their use of the area.

A footnote was added to table 3-23 to indicate that, although the overall formal determination of effect to sensitive species is "may impact individuals, but not likely to cause a trend to federal listing or loss of viability", there would be no effect to these species from mineral withdrawal.

The discussion of the affected environment and summary of effects on lynx was expanded slightly to include potential fisher habitat.

At the end of the discussion of affected environment (bighorn sheep), a statement was added to indicate that a small number of bighorn sheep occasionally remain and overwinter atop Henderson Mountain.

A statement was added to the "Conclusion" to indicate that there could be effects to wildlife habitat from other activities and use in the area regardless of whether mining activities occur.

Introduction

The study area is rich in biodiversity including a wide variety of migratory and nonmigratory species common to boreal forests and higher elevations. The types of species and numbers of animals present is impressive in a comparative sense. The location and physical characteristics of the study area allow for the presence of this diverse collection of wildlife and the habitat niches they require. The study area has few human inhabitants and is adjacent to large expanses of land in an undeveloped state. This provides habitat for animals requiring minimal contact with humans, and/or large, diverse home ranges where movement corridors are intact. Furthermore, the area is adjacent to Yellowstone National Park, which is internationally known for its large, free-roaming herds of bison and elk, and endangered species such as the grizzly bear and the gray wolf.

Biodiversity has become an important topic at the national level as well as the local level. Biodiversity, simply stated, is the variety of life and its many processes. The main elements of biodiversity are: natural levels of genetic variations, individual species diversity, biological communities, and the variety of these communities when viewed on a regional landscape scale. The Forest Service is able to play a role in maintaining biodiversity because of the large areas which are managed under Forest Service stewardship. The National Forest Management Act (NFMA) requires that National Forest System lands provide for a diversity of plant and animal communities to meet overall multiple-use objectives.

Issues

Issues relating to biological diversity within the study area that area addressed in this EIS include threatened, endangered, and USFS sensitive species including sensitive plants, USFS management indicator species, and large ungulates including elk, mule deer, moose, mountain sheep, mountain goat and bison. Additional discussion of the effects of alternatives on Yellowstone National Park was included to address concerns identified in public scoping.

USFS Management Indicator Species

The implementing regulations of the NFMA require the Forest Service to plan for the management of wildlife habitats to maintain viable populations of existing and desired native species in the planning area. To facilitate the management of all species, the NFMA further requires each Forest to identify management indicator species (see glossary and Appendix F) and establish objectives to maintain and improve their habitats. To insure that viable populations would be maintained, habitat must be provided to support at least a minimum number of reproductive individuals, and that habitat must be well distributed so that individuals can interact with others in the planning area (36 CFR 219.29).

In the Gallatin and Custer Forest Plans, management indicator species were identified (Gallatin FP, pg.II-19; Custer FP, pg. 18). They were classified as endangered or threatened, commonly hunted and fished, commonly trapped, special interest, and special habitat needs (old growth or snag dependent). Management Indicator Species (MIS) for the Gallatin and Custer National Forests are listed in Appendix F in this EIS.

Analyses presented in this section emphasize habitat considerations and other factors which are limiting or of greatest management concern related to maintaining population viability of a given species or group of species. For species identified as federally listed threatened, endangered or candidate, or USFS Northern Region sensitive, population viability is a concern because habitat changes could affect individuals of small local populations. For most species that are commonly hunted (game species) or that have widespread stable populations, population viability is not a concern because of their overall abundance. However, reductions in habitats considered limiting (winter range) or loss of security habitat (particularly if hunting pressure increases) are management concerns. Larger ungulates that are commonly hunted were included in the analysis.

Threatened and Endangered Species

In accordance with Section 7 of the Endangered Species Act, a request was made to the U. S. Fish and Wildlife Service (USFWS) for a list of federally-listed threatened, endangered and candidate species that should be considered in the Biological Assessment (Appendix E) for the proposed Cooke City Area Mineral Withdrawal (Thompson and Timchak September 4, 1996a; Thompson and Timchak September 4, 1996b). The USFWS responded for Montana (McMaster, September 16, 1996). The Wyoming Field Office concurred with the list supplied by the Montana Field office of the USFWS (Davis, October 30, 1996). On May 12, 1997, the BLM/FS (Thompson and Timchak) requested USFWS concurrence on the Determination of Effects described in the Biological Assessment. The USFWS concurred with this determination. The grizzly bear (resident), gray wolf (resident, transient), bald eagle (resident, transient), and peregrine falcon (resident migrant) were identified as the threatened and endangered species that may be present in the study area. No proposed species (see discussion below on the status of the gray wolf) or category 1 candidate species were included. No critical habitat has been designated or proposed in the study area.

On November 22, 1994, the USFWS published final rules in the *Federal Register* designating wolves reintroduced in Yellowstone NP as nonessential experimental populations. Wolves designated as nonessential experimental that are not within units of the National Park or National Wildlife Refuge systems are treated as proposed species for Section 7 purposes (refer to detailed discussion on gray wolf).

Grizzly Bear (Threatened)

Affected Environment

A self-perpetuating grizzly bear population exists within the Greater Yellowstone Area (see Glossary). Because the grizzly bear is a threatened species, the U. S. Fish and Wildlife Service has prepared and implemented a recovery plan for the grizzly bear. The future of the Yellowstone grizzly bear is uncertain and controversial. Trend data indicates the grizzly bear population is increasing following a decline caused by the closure of open garbage dumps in 1970 and 1971, in concert with other factors. One estimate of grizzly bear population trends is contained in Eberhardt and Knight, 1996. It is difficult, however, to determine actual population numbers.

As part of the U.S. Fish and Wildlife Service's recovery plan, parameters were established to facilitate recovery. Although the 1993 Recovery Plan is in litigation and pending settlement, the Plan's parameters provide a means to measure changes in the grizzly bear population over time and determine the recovery ability of the population. Meeting the goals established for these parameters would lead towards population recovery. The recovery goal for allowable known human-caused mortality is not-to-exceed 4 percent of the estimated population, with female mortality not-to-exceed 30 percent of the 4 percent. The population estimate is recalculated annually, therefore fixed numbers were not used here.

The majority of grizzly bear mortalities since 1974 are attributable to human-related incidents, such as shootings and management control actions. Almost half of the mortality risk is associated with people carrying firearms in National Forests. Known and probable grizzly bear deaths tend to be centered around specific areas in and around Yellowstone NP, such as the gateway communities of West Yellowstone, Cooke City, and Gardiner, as well as certain recreational developments, sheep grazing allotments, and other human concentration areas. High mortalities in 1994 and 1995 were in contrast to the declining trend of the previous 10 years.

Study Area. The Management Situation 1 grizzly bear habitat (habitat considered essential for recovery of the species) within the study area is underutilized by grizzly bears because of present levels of human activity, road densities, and past levels of grizzly bear mortality. The area around Cooke City and Silver Gate is considered a population sink (an area that brings grizzly bears into contact with humans often resulting in removal of bears from the population).

A cumulative effects model has been developed that allows for analysis of human impacts on grizzly bear habitat. Bear management units are the delineation at the broadest level of analysis which in turn are divided into sub-units. The cumulative effects boundary for grizzly bear for this analysis is Lamar Subunit #1 and #2 which generally includes the Lamar River drainage, and Crandall/Sunlight Subunit #1, #2 and #3, which generally includes the Clarks Fork drainage (Tyers, Aug. 21, 1996; Figure 24). The portions of the study area that drain into Soda Butte Creek and the Stillwater River are within Lamar Subunit #1. The portion of the study area that drains into the Clarks Fork is in Crandall Sunlight Unit #1.

Grizzly bears.

Mortality/Habituation. The number of human-caused grizzly bear mortalities is positively correlated both spatially and temporally with increased human access and activity, and the resulting increased contact between bears and humans.

Habituated or food-conditioned grizzly bears are much more likely to be killed by humans than bears that remain wary, especially where human activity is relatively unregulated and/or big game hunting is allowed. Habituated bears are proportionately most active and most common near human facilities such as roads, viewing areas, and recreational developments, especially in unhunted populations. Habituated bears are often perceived to be a threat to human safety; consequently, they are typically killed at a higher rate than wary bears. Thus, habituation typically increases mortality risk for individual bears except where human activity is closely regulated and the bear population is unhunted. Ungulate hunters accounted for a large portion of defense-of-life-and-property kills in the Yellowstone ecosystem since 1988. Most illegal kills occurred during the big-game hunting season.

Denning Habitat. Continent-wide, the grizzly bear shows a strong allegiance to denning areas. Grizzly bears in dens are relatively tolerant to disturbances beyond 1 km. Denning areas represent locations where bears concentrate their activities. Denning habitat is not considered to be a factor limiting grizzly bears in the Yellowstone area. Suitable grizzly bear denning habitat exists on high elevation slopes containing dense conifer cover within the cumulative effects study area. These areas include, but are not limited to, portions of Republic, Woody, Hayden Creek, Cache, Soda Butte to Lamar Valley, and Lady of the Lake Creeks (per. comm, Dan Tyers, USFS, Sept. 10, 1996). Habitat north of Cooke City where logging and fire have removed cover and the road density is high is not suitable for denning (Pers. Comm., Tyers, D. Jan. 16, 1997).

Hiding and Security. The study area, in contrast with the surrounding areas, has a high road density and high levels of human use. In addition, the quality of the hiding and security cover varies throughout the study area because of past fire and timber harvesting events.

The analysis of effects to grizzly bear habitat is in part based on an assessment of impacts to potential *core* areas. Based on current standards, core areas are defined as areas where: (1) no motorized use of roads and trails occurs during the non-denning period, and restricted roads require closure devices that are permanent; (2) no roads or trails exists that receive non-motorized, high intensity use as defined in established cumulative effects activity definitions; and (3) a minimum of 0.3 miles (500 m) exists from any open road or motorized trail. Refer to Map 3-17 for the location of potential core areas, open roads, and high use trails in the study area. Standards for core areas and other issues related to human access may change as our understanding of grizzly bear habitat requirements is refined. Core areas have yet to be formally established in the study area.

The extent of core area changes seasonally primarily due to seasonal trail use involving hiking, skiing, snowmobiling or hunting activities. As recreation use increases, core areas may shrink as a result of the increased human presence. The time of year that core areas are generally the smallest varies with elevation, which influences access and the type of recreational activity that may be occurring during that season. The seasons are spring (3/1 through 5/31), summer (6/1 through 8/31), and fall (9/1 through 11/30). The denning season is from 12/1 through 2/29 during which bears are generally not active. During the spring, at the high elevations in the Cooke City area, skiing and snowmobiling are the primary forms of recreation. During the summer, hiking is the major recreation use on trails. During the fall, hunting outside the Park influences trail use and hiking continues to influence trial use in the Park.

Food/Prey base of the Grizzly Bear. Grizzly bears are opportunistic feeders that use a wide variety of animal and plant food items. Although diet varies as much by season as by month, trends are discernible. The main items in the diet of Yellowstone grizzly bears are whitebark pine nuts, grasses and forbs, and ungulates. Ungulate meat is estimated to be one of the top two sources of energy in the average diet. Carrion scavenged from March through May can constitute a major portion of this ingested meat.

The whitebark pine component of forests is limited in distribution in Montana and is in a declining trend due to stand maturity, susceptibility to pests and the presence of non-native pathogens such as white pine blister rust. Whitebark pine is generally less common, but provides better forage habitat for grizzly bear and other wildlife than other forest types in the study area. The 26,160 acre study area contains approximately 2,340 acres of mature and 50 acres of immature whitebark pine forest. Whitebark pine forests within the study area are located at high elevations including areas within high elevation mining claims (e.g., Henderson Mountain area). Relatively few acres of whitebark pine burned in the 1988 fires.

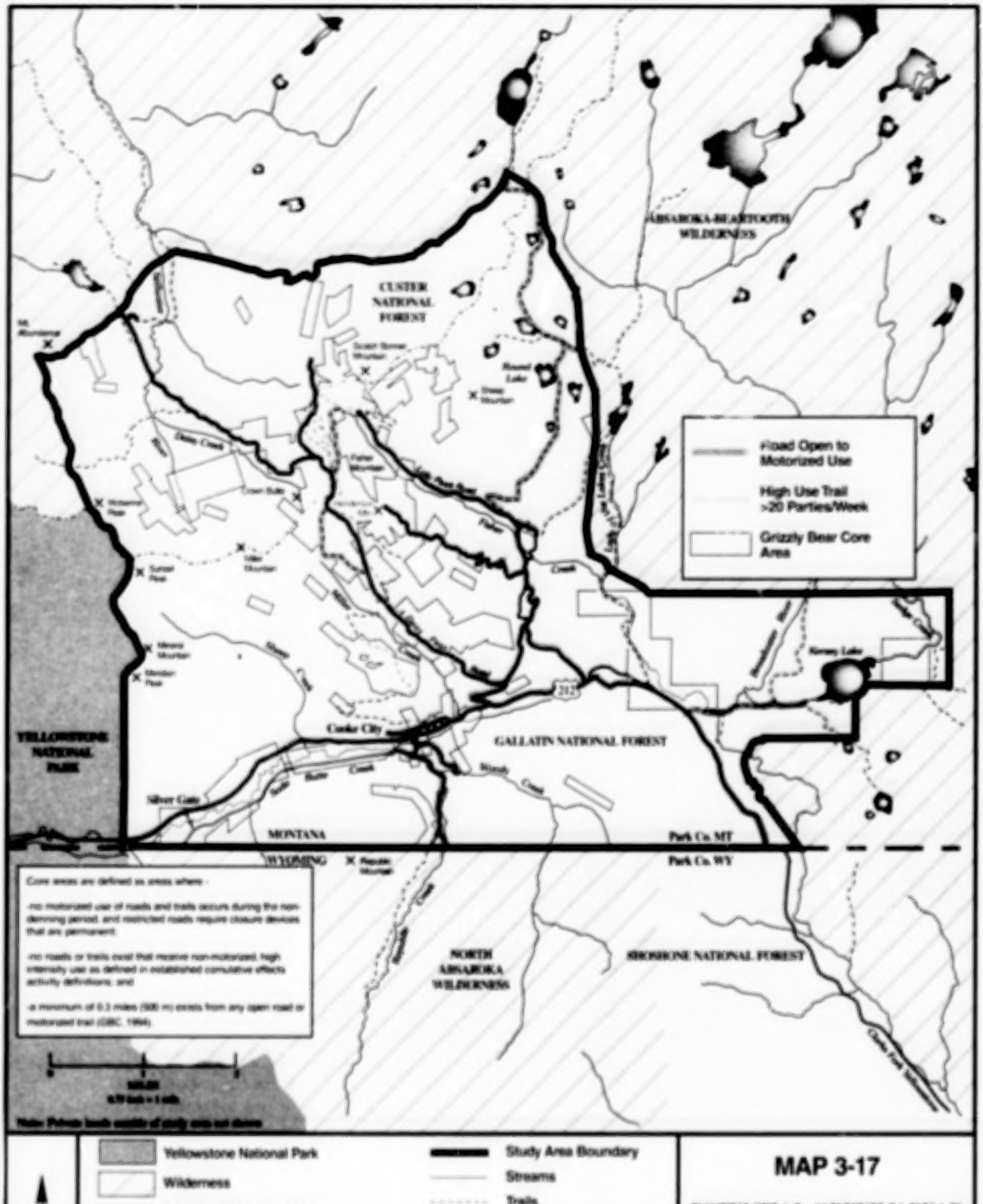
Whitebark pine seeds are an important food of grizzly bears. The use of this food by bears is positively associated with fertility and survival of the population. Use of pine seeds by grizzlies is almost entirely contingent upon the presence and behavior of red squirrels. Squirrels typically cache pine cones in middens (refuse heaps) at the base of trees or downed logs. During most years, virtually all (97%) of pine seeds used by grizzly bears are a result of excavations in middens for the otherwise closed cones.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented.

Under Scenario A-1, all 22,000 acres of federal land in the study area would remain available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to 10 mineral exploration operations may occur. Areas of most likely mineral development are shown on Map 2-1.

The 22,000 acres of federal lands remaining available for mineral entry include potential grizzly bear core areas. As potential core areas in the Republic Mountain, Reef and



Core areas are defined as areas where -

-no motorized use of roads and trails occurs during the non-denning period, and restricted roads require closure devices that are permanent.

-no roads or trails exist that receive non-motorized, high intensity use as defined in established cumulative effects activity definitions; and

-a minimum of 0.3 miles (500 m) exists from any open road or motorized trail (GBC, 1994).

MAP 3-17

POTENTIAL GRIZZLY BEAR CORE AREAS

Mineral Mountain areas have high potential for mineral development, there is a possibility that additional mineral exploration and development could occur there. Such development could eventually be in conflict with Gallatin Forest Plan Amendment 19 which provides for protection of core areas when established on the Gallatin NF. The general effects of any future development in this area are described below.

This Scenario provides for the maximum mineral development potential for the area. The NWP would be developed and other mines are possible. Habitat at risk from future mineral development include denning habitat, hiding and security cover (core areas), prey base, and whitebark pine. As the human population increases due to mine development, there would be an increased risk of human-caused mortality.

Mortality/Habituation. Greater numbers of unpredictably dispersed and armed humans will result in higher mortality risk for the population of grizzly bears. Human-caused mortality is considered to be a factor limiting grizzly bear populations. Risk attributable to big-game hunters is disproportionately high because hunters are armed, often dispersed in an unpredictable way across the landscape, and typically associated with animal remains that attract bears.

Increasing local populations related to mineral development may increase the potential for habituated bears. Habituated or food-conditioned grizzly bears are much more likely to be killed by humans than bears that remain wary, especially where human activity is relatively unregulated and/or big game hunting is allowed. Habituated bears are proportionately most active and most common near human facilities such as roads, viewing areas, and recreational developments, especially in unhunted populations. Habituated bears are often perceived to be a threat to human safety; consequently, they are typically killed at a higher rate than wary bears. Thus, habituation typically increases mortality risk for individual bears except where human activity is closely regulated and the bear population is unhunted.

Denning Habitat. Direct impacts of mining-related actions on denning habitat are less likely if mining occurs in roaded, high use areas where the current level of human activity probably precludes use of suitable denning habitat by grizzly bear. The highest mineral development potential coincides with the roaded area of high human activity. If development is concentrated here, direct effects to grizzly bear denning sites would be minimal. However, if exploration and discovery occurs in the grizzly bear core areas like Republic Mountain or Mineral Mountain, there is an increased risk of effects to bear denning habitat.

It is not possible to completely anticipate the potential indirect impacts to denning bears that might be generated in the study area by this alternative, because it is not possible to know where each bear will den during the next 20 years relative to potential mining-related actions. Once additional mining related actions were established, the human associated activity would probably discourage bears from denning within a distance of the activity. Grizzly bears, while in dens located outside the area of human activity associated with mining related actions, would probably not be affected.

Yellowstone NP and adjacent Wilderness contain abundant available denning habitat in addition to habitat found within the study area. Denning habitat is not considered to be a factor limiting grizzly bear populations. Increases in human activity within denning habitat could, over time, result in increased human-caused bear mortality and could reduce grizzly bear populations.

Hiding and Security. Vegetation clearing for mining-related actions could result in direct loss of forested habitats and could potentially reduce hiding and security cover. Reconstruction or construction of roads could result in motor vehicle access to previously unroaded areas and reduce security for grizzly bears.

There is an increased risk of overall mortality if miles of open roads and numbers of town-sites or major recreational developments increase in occupied grizzly bear habitat areas. If mining-related actions occur in existing high road density areas there would be minimal direct impact on potential grizzly bear core areas. If mining-related actions, however, occur in unroaded areas, there could be reductions in potential grizzly bear core areas. High open motorized access route density is defined as greater than 2 miles/square mile for open motorized access routes. Mitigation could help limit open road densities. Mining-related actions in the vicinity of trailheads could result in indirect impacts or shift recreation activity into currently unroaded areas currently functioning as potential core areas. A reduction in potential core areas would tend to increase human-grizzly bear interactions which would tend to lead to increased bear habituation and mortality.

One measure of potential impacts is the range of projected impacts from the New World Project (NWP PDEIS, Wildlife Technical Report, Tyers, Aug. 21, 1996, P. 64; 6.3.3). Increasing recreation use on trails results in a decrease in grizzly bear core area when the use exceeds 20 parties per week. Changes from low-use to high-use trails would most likely occur closest to housing facilities, trailheads and new roads because of increased human population growth associated with mining. Some low-use trails may increase to a high use category immediately as opposed to a change from low to high over a longer period of time without a mine. The actual impacts from a new mine would depend on the location of mining-related actions in relation to a potential core area. Increases in recreational activity may occur without a mine due to expected trends for visitation in the Greater Yellowstone Area.

The potential core areas of the Crandall/Sunlight subunit #1 and Lamar subunit #1 would be the most affected by the mine (NWP PDEIS, Wildlife Technical Report, Tyers, Aug. 21, 1996, Table 8, Figure 11). In the Crandall/Sunlight subunit #1, potential core area would be reduced by 12 percent in the summer (from 59 to 47 percent) and by 16 percent in the fall, due to anticipated increases in human presence in existing potential core areas. The year average potential core area would be reduced by 8 percent. The potential core area would not change in the spring. In the Lamar sub-unit #1, the potential core area would decrease by about 9 percent in the spring, summer, and year from about 89 to 80 percent. The fall potential core area would decrease by about 4 percent.

The potential core areas in Crandall/Sunlight sub-unit #2 would decrease slightly in the spring (2 percent), with decreases of 3 to 4 percent in the summer and fall. The potential core area of Crandall/Sunlight sub-unit #3 and Lamar sub-unit #1, which are further from the mine area, would decrease by less than 1 percent over all seasons. The impacts on potential core areas from additional mineral development would vary depending upon the location and size of future mineral development activities.

The interim standard under Gallatin Forest Plan Amendment No. 19, February 1996, is to allow no increase in open motorized access route density or total motorized access route density in established core areas unless allowed through consultation with the USFWS. A decrease in established core areas could lead to a site-specific amendment to the Gallatin Forest Plan, and/or mitigation as determined by the USFWS.

Food/Prey Base. There would be an increased risk that the whitebark pine component of the forest could be removed from mining-related actions. One measure of potential impacts is the range of projected impacts from the New World Project which vary from approximately 3 to 128 acres of old growth whitebark pine lost based on the alternatives considered in detail (NWP PDEIS Wildlife Technical Report, Tyers, Aug. 21, 1996, Table 10, P. 80). These areas would vary for other mines, depending on acreage for each mine and the portion of the mine within or outside of old growth whitebark pine stands. In addition to trees, the removal of vegetation could have an affect on the local berry, tuber, and other plant-related potential grizzly bear food items.

Mining-related population increases could lead to an increase in hunting pressure which could affect grizzly bear prey species. However, higher hunter harvest, potentially affecting the number of ungulates in the area, may not occur. Harvest of bighorn sheep, mountain goat, and moose is restricted to permit hunting only. For example, the number of the moose hunting permits available is seven. The number of permits for these species will not increase because of an increase in interest. Harvest of elk and mule deer in the area has never been high and would not be expected to increase appreciably.

Yellowstone National Park. Plowing of snow on US 212 east of Cooke City would increase human access into the Park during the winter. This would create minimal risk to bears because they would be in their dens hibernating. There would be an increased risk of human-caused mortality during the late winter as well as the non-denning season. Increasing local populations and mineral development could result in additional bear mortality, potentially affecting the bear population in the Greater Yellowstone Area which includes Yellowstone NP.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented.

Under Scenario A-2, 17,820 acres of federal land would remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity assumes there is a 2 percent probability of an underground mine and the potential for up to five exploration operations. Areas of most likely mineral development are shown on Map 2-2.

While mining could still occur on the 17,820 acres of available federal land, the NWM Agreement removes the area of highest potential from future mining. The likelihood of other large mines is greatly reduced. The risks associated with increasing human population and loss of secure habitat are substantially reduced. Federal lands that remain available for mineral entry consist primarily of undeveloped lands including potential grizzly bear core areas. As potential core areas in the Republic Mountain, Reef, and Mineral Mountain areas have high potential for mineral development, there is a possibility that additional mineral exploration and development could occur there. Such development could eventually be in conflict with Gallatin Forest Plan Amendment 19 which provides for protection of core areas when established on the Gallatin NF. If a major mine is developed on lands open to mining, effects would be similar to those described for Scenario A-1, depending upon the size and location of future mines.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented.

Under Scenario B-1, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Areas of likely mineral development are depicted on Map 2-3.

The immediate effect of the mineral withdrawal is on 17,760 acres of National Forest land which includes most of the identified potential grizzly bear core areas within the study area. While the withdrawal tends to physically protect the potential core areas from mineral development, effects from mining on private land and unpatented mining claims in the central portion of the study area are likely to be similar to those described for Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under Scenario B-2, 17,760 acres of federal land would be immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement, including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims, would not be available for mining. Sixty acres of unpatented mining claims and 2,420 acres of private land would remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity assumes no mines would be developed and one exploration operation is possible. Areas of most likely mineral development are depicted on Map 2-4.

The NWM Agreement, combined with the mineral withdrawal, limits future mining to 60 acres of existing unpatented mining claims and to 2,420 acres of private land. The area of highest mineral potential is largely unavailable for future mining. The forecast for mineral development predicts no major mines and limited exploration. Under this Scenario, changes to habitat and increases in the human population due to mining are not anticipated.

Mining-related activities are not likely to affect suitable denning habitat, grizzly bear hiding and security areas, and forested habitats including whitebark pine. Reconstruction or construction of roads that could result in motor vehicle access to previously unroaded areas and reduce security for grizzly bears are not likely to occur as a result of mining. Potential core areas would remain at about current levels if mining related actions are limited to exploration for small mining operations. The potential for human/grizzly bear conflict will remain, but human presence in the area will not increase due to mine development. Based on a projection of recreation use trends, it is estimated that some low use trails may increase to a high use category in approximately the next 10 years resulting in a cumulative reduction in habitat if these trails are located within grizzly bear core areas. In contrast, changes associated with the establishment of a major mine would be almost immediate.

Gray Wolf (Experimental Population)

Affected Environment

Historically, the former range of the Northern Rocky Mountain subspecies of the gray wolf extended from Canada into the northern two-thirds of Wyoming. In the early days of Yellowstone NP, there was a government-sponsored program to eliminate wolves. Nationally, the interest was to preserve livestock, but locally this was done in deference to ungulates. In recent years, gray wolves have been reported in the Yellowstone NP area, but sustained pack activity in the vicinity has not been documented for years. At this time there is no ongoing pack activity in the immediate vicinity of the study area, though wolves may occasionally pass through the study area (pers. comm., Joe Fontane, USFWS, October 28, 1996 and January 22, 1997). As of January 1, 1997, at least three wolf packs reside in the Lamar Valley in Yellowstone NP west of the study area (pers. comm., Mary Hektner, Yellowstone NP, NPS, Jan. 14, 1997).

The Yellowstone Ecosystem has been designated as a recovery area for the gray wolf. It has been estimated that Yellowstone NP's northern winter range could support about 75 wolves or about nine packs. The Park could also overlap with the territories of an additional three to four packs. The study area could include portions of one or more territories of these packs.

Recent re-introductions of the gray wolf in Yellowstone NP raises the potential of possible project effects on wolf populations. According to 50 CFR Part 17 (November 22, 1994), "the reintroduced wolves in Yellowstone NP are classified as a 'nonessential experimental' population according to Section 10(j) of the Endangered Species Act (ESA). 'Nonessential experimental' animals located outside national wildlife refuges or national park lands are treated for purposes of Section 7 of the Act, as if they were only proposed for listing." In other words, although the wolf is an endangered species, it is treated on federal lands as if it were proposed for listing. According to 50 CFR Part

17, "there are no conflicts envisioned with any current or anticipated management actions of the FS or other federal agencies, and management of wolves in the experimental population would not cause major changes to existing private or public land use restrictions. Land use restrictions on public lands could be used, however, to control human intrusion of den sites when fewer than six breeding pairs exist within the experimental area."

Gray wolves are wide-ranging and their distribution is tied primarily to that of their principal prey (elk, bison, moose, etc.). Key components of wolf habitat are considered to be: (1) a sufficient, year-round prey base of ungulates (big game) and alternate prey, (2) suitable and somewhat secluded denning and rendezvous sites, and (3) sufficient space with minimal exposure to humans. Key summering areas for ungulates, especially elk, are considered to be of particular importance in managing for wolf recovery. During winter periods, deer, elk, and moose continue to represent principal prey items for wolves and wolf distribution is keyed to the winter ranges of these species. In Yellowstone NP, an established wolf population was predicted to prey on ungulates in the following decreasing order of importance: elk, bison, mule deer, moose, pronghorns, and bighorns. Potential wolf use of the study area would coincide with the presence of ungulates on seasonal ranges. The absence of cattle and domestic sheep grazing in the study area reduces the likelihood of conflicts that could result in wolf mortality and/or hinder their use of the study area.

Summary of Effects

Mining activities in the study area are not likely to affect wolf denning habitat due to the high elevation of the area. Mining activity at lower elevations within the cumulative affects area and activities along the powerline corridor might occur near and adversely affect wolf denning areas. The study area could receive some year-round use by wolves dispersing from Yellowstone NP or an established pack's territorial activities. Of the larger mammals in the area, wolves are expected to be the least affected by human activities. Researchers have found that wolves were generally not disturbed by humans at a distance greater than 0.5 mile in open areas and 0.25 mile in forested areas. Studies of moose, caribou, grizzly bear, and wolf responses to exploration and aircraft activity indicated that wolves appeared the least disturbed and showed evidence of habituation. Mining-related actions could adversely displace individual animals, but would not have any adverse effect or limit the viability of introduced or naturally dispersing populations of gray wolf. Increased human presence could result in illegal kill of animals from firearms or from vehicle collisions with wolves on highways. There is an increased risk that prey/vehicle collisions on snowplowed sections of highway may attract wolves into the snowplowed highway corridor. Wolf mortality may result from wolf/vehicle collisions as a result of snowplowing and subsequent snow berms and increased motor vehicle traffic on currently unplowed segments of highway.

The immediate effect of the mineral withdrawal is on 17,760 acres of federal land that would no longer be available for mineral entry (Scenario B-1, B-2). The withdrawn land is contiguous to surrounding wilderness and Yellowstone NP, providing relatively secure habitat for wolves as well as prey species. The potential for mining-related effects to pack activities, denning habitat, or principal prey species would be low. See related discussion on potential prey of gray wolf under the sections on Moose, Elk, Mule deer, and Bison.

Mining-related disturbances are expected to be minimal under Scenario B-2. The potential expansion of wolf packs into this area would not be adversely affected by mining-related impacts.

Bald Eagle (Threatened)

Affected Environment

Bald eagles are residents and winter visitors in Yellowstone NP and the surrounding Yellowstone ecosystem. The Yellowstone ecosystem and the analysis area lie within the Greater Yellowstone Recovery Zone. Suitable bald eagle nesting habitat might occur within the study area and powerline analysis areas. Foraging habitat is present, including Lake Abundance. Bald eagles are occasionally seen at the larger lakes during the summer, but there are no known nest sites. Recreational activity at lakes as well as the high elevation and late ice-free season renders these sites relatively unsuitable as nesting habitat. Bald eagles may also occasionally wander over the powerline corridor, especially near the Clarks Fork River and in the vicinity of Swamp Lake. Disturbance might occur to bald eagle foraging within the study area and potentially to bald eagle nesting habitat within the powerline corridor.

Summary of Effects

As suitability of the study area for nesting is low due to the high elevation of the area lakes, future mining is not likely to affect bald eagle nest sites. Connected actions including powerline construction and snowplowing additional highway for mining-related actions associated with the NWP area, could occur in areas of suitable nesting or foraging habitat for bald eagles. Construction of powerlines to facilitate mining-related actions might adversely disturb nesting bald eagle or adversely affect foraging habitat located outside of the study area. Construction of a powerline is a short-term project; effects to nest sites could be mitigated by timing. Additional mining-related traffic and opening an additional winter access to Cooke City would result in vehicle/ungulate collisions. There is an increased risk that eagles attracted to the carrion could die as a result of collisions with vehicles.

Scenario B-2 reduces the risk to bald eagles because snowplowing and powerline construction are not likely to occur. Scenario B-1 would result in less potential disturbance around study area lakes as they are withdrawn from mineral entry. However, mining in the central portion of the study area would likely require the new powerline and snowplowing US 212. Under Scenario B-2, existing habitat and prey base for bald eagles would not likely change as a result of mining.

Peregrine Falcon (Endangered)

Affected Environment

The peregrine's preferred nest site is a rugged, remote cliff (100 to 300 feet in height) usually overlooking water or marshy areas where prey is abundant. Preferred hunting areas include cropland, meadows, river bottoms, marshes, and lakes that attract abundant bird life. Peregrines may travel up to 17 miles from nesting cliffs to hunting areas. Peregrine falcons are considered uncommon in Yellowstone NP, but nesting has been documented. Recent reintroduction efforts have increased the number of nesting pairs within the Greater Yellowstone Ecosystem. There are abundant suitable cliff nest sites in the study area, but much of the area is still covered with deep snow during the nesting season and is not considered attractive to nesting peregrines. Dispersing or transient birds may occasionally fly over the study area.

Summary of Effects

Mining-related actions in the study [illegible]lly occur at high elevations would not distur[illegible]cur near suitable nesting or foraging habitat for [illegible] falcon. Construction of powerlines to facilitate [illegible]-related actions might adversely disturb nesting peregrine falcons or adversely affect foraging habitat located outside of the study area, but these effects can be mitigated if a nest site is discovered. Snowplowing of additional segments of highway would not affect the peregrine falcon. The benefit of the mineral withdrawal and the NWM Agreement are minimal due to the slight risk future mining presents to peregrine falcons.

USFS Northern Region (R-1) Sensitive Species

Sensitive species are those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (USDA, 1989).

Determinations of effects are displayed by species and alternative in Table 3-24. Determination of effects to USFS Northern Region sensitive species included consideration of direct, indirect, and cumulative effects (past, present, and reasonably foreseeable).

As wolverine and lynx are present in the study area, and these species are particularly susceptible to habitat alteration and are sensitive to human activity, a discussion of the affected environment and environmental effects for these species follows. For a detailed discussion of the habitat requirements and the potential effects to other sensitive species listed above, refer to the NWP PDEIS, Wildlife Technical Report.

Wolverine (USFS Sensitive)

Affected Environment

Wolverines are wide-ranging and exist in low densities in large roadless or isolated areas. Wolverines prefer rugged, relatively inaccessible mountainous areas at the high elevations in the summer and move to lower (but still snowbound) elevations in the winter. Seventy percent of all relocated animals were found in large areas of medium or scattered mature timber. Edge areas between habitats, small timber pockets, and rocky, timbered benches accounted for the remainder of the relocation sites. Subalpine fir was the predominant timber type selected by wolverines. One conclusion of a study was that wilderness or remote country where human activity is limited appears to be essential for the maintenance of viable wolverine populations. Food availability is believed to be a primary factor in determining movement patterns and home ranges for wolverines. The scavenging life-style of wolverines results in seasonal long movements and relatively large home ranges. Wolverine have been recorded in Yellowstone National Park in recent years, but the actual status and range of this species in the Greater Yellowstone Ecosystem remain uncertain. Wolverine sightings and sign have been reported within the study area.

TABLE 3-24: USFS NORTHERN REGION SENSITIVE ANIMALS SPECIES PRESENT, CONCLUSION OF EFFECTS FOR ALTERNATIVES CONSIDERED IN DETAIL (WITH THE NWM AGREEMENT) [1]

Common Name	Alternative A (No Action)	Alternative B (Proposed Action)
Townsends's big-eared bat, Wolverine, Lynx, Fisher	Insufficient data to make a determination of effects.	May impact individuals, but is not likely to cause a trend to federal listing or loss of viability.[2]
Spotted bat, Common Loon, Harlequin Duck, Boreal Owl, Black backed woodpecker	May impact individuals, but is not likely to cause a trend to federal listing or loss of viability.[2]	May impact individuals, but is not likely to cause a trend to federal listing or loss of viability.[2]

[1] USFS Northern Region (R-1) sensitive species (Risbrudt, 1994). USFS Northern Region sensitive animal species absent from the study area were not included in this table.

[2] There would be No Effect on these species from a mineral withdrawal, but the overall determination of cumulative effect of the alternative is "May impact individuals, but is not likely to cause a trend to federal listing or loss of viability".

Summary of Effects

Future mining may affect wolverines by direct loss of habitat, increased human disturbance, or increased trapping mortality due to increasing human populations and improved access. Under Scenario A-1, there is an increased risk that mining-related activities could affect the foraging area of wolverines in the study area. Wolverine foraging areas could include sub-alpine fir areas containing snowshoe hare, carrion sources, and big game winter ranges.

Mortality through incidental trapping is considered the principal threat to populations of wolverine. The trapping season coincides with the winter months when furbearer pelts are at their prime. Although the extent of trapping is unknown, trapping activity in the area of a major mine is assumed to be relatively minor due to the general lack of preferred habitats of furbearers targeted by trappers. Improved winter access to the area and the increase in local population could result in increased trapping. The State of Montana has the authority to regulate trapping in the area.

Scenario B-2 substantially reduces the likelihood of a major mine development and the resulting effects associated with increased disturbance, increasing human population, and improved access. The risk of adverse effects to wolverine and their habitats is reduced. The risk is reduced to a lesser extent with Scenario B-1. While much of the roadless habitat is not available for mining and would continue to provide habitat for wolverines, the anticipated development in the central portion of the study area would lead to effects similar to those described above.

Lynx and Fisher (USFS Sensitive)

Affected Environment

Lynx are found in suitable habitats in the Rocky Mountains as far south as Utah. Lynx habitat is generally described as climax boreal forest with a dense undercover of thickets and windfalls. Advanced successional stages of forests and dense conifer stands often are preferred habitats of lynx. Denning habitat is characterized as mature lodgepole pine and old-growth (150-250 years old) Engelmann spruce and subalpine fir stands (1 to 5 acres in size) interspersed with other cover types. Large amounts of woody debris are important for denning sites. Lynx feed in young forests, especially where their primary prey, snowshoe hare, is abundant. Suitable lynx habitat in the study area includes mature and old growth forested areas for den sites and young forests (sapling and older stands) for feeding. Unsuitable habitat includes recently burned areas (crownfires), recently clearcut areas, and areas above timberline.

Habitat for fisher (Douglas and Strickland, 1987) is similar to mature forest habitat component for lynx; unsuitable habitat for lynx previously discussed is also unsuitable for fisher. Two anecdotal observations have been made of fisher adjacent to the project area, but the status of this animal has not been substantiated in the study area.

Summary of Effects

Future mining may result in removal of mature lodgepole pine and spruce-fir habitats in the study area. One measure of potential impacts is the range of projected impacts from the New World Project which ranged from approximately 4 to 37 acres loss of mature lodgepole pine and spruce-fir forest based on the alternatives considered in detail in the NWP PDEIS, Wildlife Technical Report, Tyers, Aug. 21, 1996, (P. 83, Table 11). These acres would vary for other mines depending on the size and location of future activity. If a powerline is constructed into Wyoming, lynx denning habitat (mature forest), and potential fisher habitat, would be converted to grass/shrub/sapling dominated vegetation for the next 20 years. One measure of potential impacts of a powerline is the range of projected impacts from the New World Project which ranged from approximately 169 to 180 acres loss of mature lodgepole pine and spruce-fir forest based on the alternatives considered in detail in the NWP PDEIS, Wildlife Technical Report, Tyers, Aug. 21, 1996, (P. 83, Table 11). The potential effects of increased human population, access roads for trappers and trapping mortality previously discussed under Wolverine would also apply to lynx and possibly to fisher.

Under Scenario B-2, existing lynx and potential fisher habitat and levels of trapping would not likely change as a result of future mining. The risk is reduced to a lesser extent than under Scenario B-1. While much of the roadless habitat is not available for mining and would continue to provide habitat for lynx, the anticipated development in the central portion of the study area would lead to effects similar to those described above for No Action.

USFS Northern Region Sensitive Plants

Affected Environment

USFS sensitive plants (Risbrudt, C., June 10, 1994) were considered in the analysis (Table 3-25). Additional background information is contained within Vegetation Chapter NWM PDEIS, Aug. 21, 1996. Present knowledge of sensitive plant species and distribution allows for only vague predictive capability for potential sensitive plant habitat. The animal species that pollinate the sensitive plants are generally not known. Watch plant species were identified (Shelly, S. July 28, 1994), and were considered indirectly through the analysis of sensitive plants. There is no USFS requirement to address Watch or Natural Heritage Program (NHP) Special Interest Species in the biological evaluation (pers. comm., S. Shelly, USFS, October 28, 1996).

The following species, considered rare by Montana NHP, were considered indirectly under biodiversity in this analysis, but are not addressed in the analysis of sensitive species, because they are not currently designated as such by the USFS Northern Region: alpine nerved sedge (Carex neurophora), narrow-winged sedge (Carex stenoptila), Austrian whitlow-wort (Draba fladnizensis), and small-flowered pennycress (Thlaspi parviflorum). These species were not detected in surveys in the study area.

Summary of Effects

In general, for a mineral withdrawal analysis where there is no site specific development proposal, there is insufficient data to make a determination of effects. Sensitive plant surveys are completed prior to surface disturbing activities on federal lands. Impacts to sensitive plants can often be mitigated by relocating surface disturbing activities. With future development, there is an increased risk that USFS Northern Region sensitive plants may be affected. With the mineral withdrawal, the risk is reduced on 17,760 acres in the short term, and up to 22,000 acres in the long term if the NWM Agreement is implemented.

Relatively small known populations could generally be avoided. Some large populations occurring within the study area might be affected by mine development. Populations not detected in surveys could be impacted. The populations of plant species for which plant habitat and associated plant pollinators is well known would have a higher probability of being protected than would species for which habitat is not well known. In general, regulations protecting wetlands would also tend to protect sensitive plants occurring in those habitats. Sensitive plants occurring in all wetlands filled by mining-related actions would be lost. Protection for USFS Northern Region sensitive plants does not apply to, nor would surveys be required on private lands.

Sensitive or rare plant species in the area are characterized by small, isolated populations which often occupy microsites. Maintenance of viability of sensitive species requires protecting the known populations and sites or habitats they are capable of occupying under colonization. Ground disturbance and alterations in light, moisture, and nutrient regimes within forest and grasslands can affect sensitive plants and their habitats. These effects can take two forms: either the actual destruction of individuals in a population, or the adverse modification of indicator habitat considered critical to the maintenance of viable populations.

Management activities would differ in their intensity of impact on sensitive plants within the study area. Road and mine site construction would have the greatest effect on sensitive plants, since the existing populations and habitat within the road clearing limits would be physically altered and in most cases removed.

TABLE 3-25: USFS NORTHERN REGION (R-1) SENSITIVE PLANTS POTENTIALLY PRESENT IN THE STUDY AREA[1]

COMMON NAME	SCIENTIFIC	STATE STATUS[2]	PRESENCE
Pink agoseris	*Agoseris lackschewitzii*	G3/S2	Seeps and springs. Present in study area.
Large-leaved balsam root	*Balsamorhiza macrophylla*	—	Not detected in surveys in the study area. Potentially present.
Slender paintbrush	*Castilleja gracillima*	G3G4-/S1	Present in study area.
Parrot head indian paintbrush	*Castilleja longispica*	—	Not detected in surveys in the study area. Potentially present
Hiker's gentian	*Gentianopsis simplex*	—	Not detected in surveys in the study area. Potentially present.
Northern rattlesnake plantain	*Goodyera repens*	—	Not detected in surveys in the study area. Potentially present.
Discoid goldenweed	*Haplopappus macronema var. macronemea*	—	Not detected in surveys in the study area. Potentially present.
Hall's rush	*Juncus hallii*	G4G5/ S1	Montaine to supalpine, moist to dry meadows and slopes. Not detected in surveys in the study area.
Wolf's willow	*Salix wolfii var wolfii*	G4-/S1	Wetlands including seeps and springs. Present in study area

[1] USFS Northern Region (R-1) sensitive species (Rishrudt, 1994). USFS Northern Region sensitive species determined to be absent from the study area were not included in this table. The proposed Cooke City Area Mineral withdrawal is entirely within USFS Northern Region (R-1) and does not extend into the USFS Rocky Mountain Region (R-2) in Wyoming.

[2] Natural Heritage Program rankings on a State (S) and Global (G) basis. G1/S1 = Critically imperiled in State (S1) or globally (G1) because of extreme rarity and especially vulnerable to extirpation; G2/S2 = imperiled in state (S2) or globally because of rarity or vulnerability of extirpation; G3/S3 = rare in state or very rare and local throughout its range globally; G4 = apparently secure globally though it may be quite rare in parts of its range; G5 = Demonstrably secure globally, may be quite rare in parts of its range.

Chemical changes in ground water could impact sensitive plant populations, especially those in moist soil environments. Sensitive plant tolerance to changes in soil acidity, heavy metals, or toxins is generally unknown. The tolerance of pollinators of sensitive plants to these chemical changes is also unknown.

Management activities and their effects on sensitive plant species can be both long and short-term. Activities that occur once on a specific population may not affect the population or its habitat, while repeated activities have the potential to significantly impact the population. Activities prescribed by the alternatives may have cumulative effects on species viability if individual effects occur over a wide geographic range or on large numbers of sensitive plant populations.

Population size, associated habitat and topography along with the intensity, duration, and timing of the proposed activity were considered in determining effects to sensitive plants. On federal lands, site specific impacts and avoidance would be considered on a site specific basis at the time of mining application. At the mine application level, a biological evaluation is required as a condition for approval of a surface use plan on federal lands. A sensitive species survey(s) may be required to complete the biological evaluation. The inclusion of sensitive plants in the Northern Region Sensitive Species list and respective surveys to detect these plants has primarily occurred after 1989. There is limited written monitoring data from which to make projections of effectiveness of mining mitigation measures on sensitive plants, populations, or potential habitat. Past surveys have generally focused on undisturbed areas and have generally not included areas that have been affected by mining related actions. Surveys in areas of past mining related actions detect only plant populations that survived impacts. The effect of alternatives on the habitat of pollinators of sensitive plants is unknown.

Determination of Effects

Determination of effects for the mineral withdrawal for sensitive plant species would be, "may impact individuals, but is not likely to cause a trend to federal listing or loss of viability" (MIIH) for all sensitive plant species potentially present in the study area. While the effects of the mineral withdrawal would be "no effect," the potential for cumulative effects from abandoned mine reclamation and associated actions as part of the New World Mine Agreement would be MIIH. There is insufficient site-specific information to make a determination of effects for other alternative(s) considered in detail (Scenarios A-1, A-2, and B-1). Determinations of effects are based on USFS Form 2 (R-1-2670-95) initially determined by Donald C. Sasse, USFS Wildlife Biologist, and reviewed and approved by Steve Shelly, USFS Northern Region Botanist, January 23, 1997.

Other USFS Management Indicator Species Or Identified Sub-Issues

Several other MIS species, in addition to those previously mentioned, are discussed in this section. Refer to Appendix F for a complete list of MIS.

Moose (Sub-Issue)

Affected Environment

Population Trends. The Shiras moose in the mountains of Wyoming and Montana is thought to be generally stable or slowly increasing throughout this area. However, some big game specialists consider moose populations in the intermountain west to be fairly fragile; numbers are usually small and their habitat (riparian areas and older forests) is especially vulnerable to human encroachment. Moose populations are often hard to survey and definitive statements on numbers and trends can be difficult to make, which hampers management efforts. Moose are thought to have declined across the northern Yellowstone winter range and surrounding areas due to the effects of a major fire event in 1988. The moose population in the study area is estimated at 25 to 50, which represents one of the larger concentrations of this species in the northern part of the Greater Yellowstone Area.

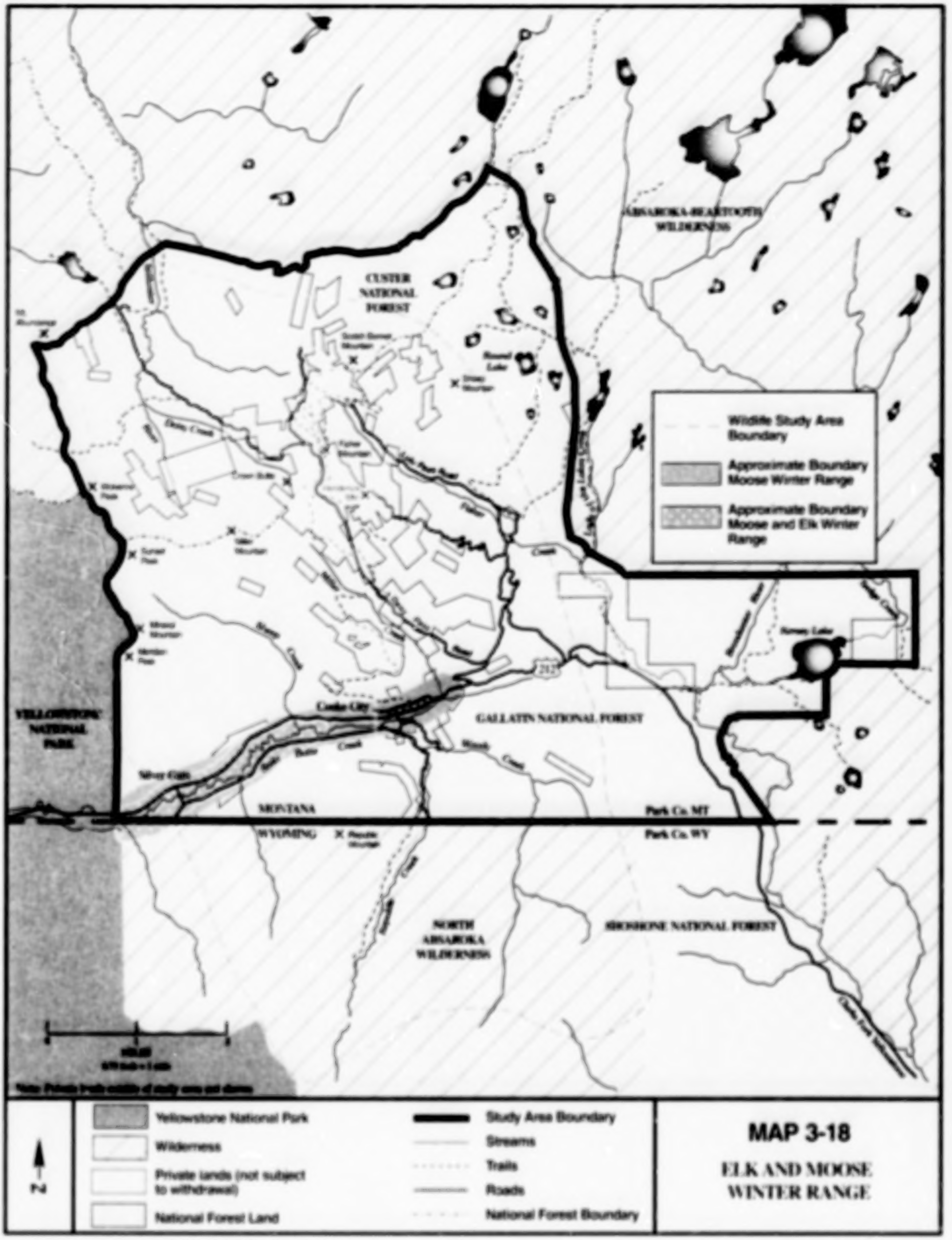
Habitat Selection. In the Yellowstone region, mature and old-growth spruce-fir and lodgepole pine cover types were the most frequently used habitats by moose from November through April (Tyers, 1990, as cited in Tyers, Aug. 21, 1996). During late spring, summer, and fall, moose are usually found along stream bottoms and in moist meadow areas in mid-to-high elevation coniferous habitats, although they can be found at most elevations during these seasons. Upland spruce-fir and aspen stands are also heavily used habitats.

The best habitat for moose in the Cooke City Basin consists of willow communities/moist meadows and areas with mature conifers (older lodgepole, subalpine, and Douglas fir forests). Older forests are used during all seasons and provide several important habitat components: hiding and thermal cover, an understory of sub-alpine fir seedlings and saplings for winter browse, and canopies that ameliorate snow conditions as well as summer heat. Moose frequent willow communities during the summer, fall, and early winter to browse on shrubs but are often excluded from them by snow during mid- and late-winter. Moose winter range within the study area is shown on Map 3-18.

Summary of Effects

Potential impacts to moose from mining-related actions are discussed under two general categories: alteration of habitat (seasonal and winter range) and risk of mortality due to contact with humans. Seasonal ranges, as compared to winter range are not considered to be a limiting factor for moose in the cumulative effects area. Compared to winter browse, summer forage is plentiful and access to it is not restricted by any factor of the natural environment. Average snow conditions on seasonal ranges are in excess of what moose can contend with and still forage effectively during the winter.

Future mining would likely affect riparian and wetland habitats which support willow stands and provide spring through early winter foraging habitat for moose. For example, alternatives under consideration for the NWP would fill from 18 acres up to 81 acres of this habitat type, depending upon the alternative selected. Additional acres of wetland are at risk due to mine dewatering and stream diversions. Another measure of potential impacts is the loss of mature spruce-fir habitats. Alternatives under consideration for the NWP affect from approximately 5 up to 134 acres depending upon the alternative selected (NWP PDEIS, Wildlife Technical Report, Tyers, Aug. 21, 1996, P. 83, Table 11). Effects to wetlands and mature spruce-fir forests are likely to increase with additional mining and exploration as much of the gentler slopes in the area is occupied by wetlands.



MAP 3-18

ELK AND MOOSE WINTER RANGE

The loss of winter habitat can adversely affect moose populations. Unlike moose in many other geographic areas in North America, those in the Cooke City area are strongly linked to mature coniferous forests for habitat during all seasons; especially the winter months. There is a lower risk that a mine(s) would be situated within moose winter range based on mineral occurrence potential and the location of existing moose winter range. There is however, a higher risk that access roads to the mine and associated facilities may be located within moose winter range. Moose are to some extent likely to utilize snow-free roads as travel ways.

There would be an increased risk that mining-related actions could displace moose from adjacent areas of undisturbed habitat. There is a risk that moose may generally avoid habitats within 1 to 2 kilometers (0.6 to 1.2 miles) of human activity. There is an increased risk that mining-related actions would preclude moose use of habitats along drainages currently unimpacted by human disturbance and locally displaced individuals may be eliminated and could result in reductions in the local moose population for the next 20 years. Although moose hunting is strictly controlled by permit, illegal harvest may increase with increases in the human population.

It is expected that, at a minimum, Highway 212 and the access roads to each mine would be kept open in the winter. Vehicle collisions with moose are more likely to occur with increased removal of snow from roads and increased travel by motor vehicles on moose winter range. Moose may seek relief from snow conditions and use the plowed surfaces, dispersing to formerly inaccessible areas along the corridors created. The snowplowed corridors could result in increased risk of encounters between moose and vehicles that are energetically very expensive for moose as they attempt to out-run the vehicle or climb out of the road cut and into deep snow.

Statistics for Highway 191 on the northwestern boundary of Yellowstone NP provide an indication of potential moose mortality from vehicle collisions. Highway 191 and US 212 are similar in that both are in high snow fall areas where deep road cuts are created with plowing, and they both traverse moose summer and winter range. It is approximately 11 miles from Cooke City to the junction with Highway 296. Based on an average of 0.22 moose killed per mile annually on Highway 191 over a 30-year period, a direct application to Highway 212 would equate to approximately 2.42 moose killed per year (0.22 moose/mile x 11 miles Cooke City to the Highway 296 junction). These rates could vary considerably based on the frequency and duration of vehicular traffic, type of vehicle, snow plowing to provide escape routes for moose, recreation use, and density of moose in the area.

The powerline corridor would traverse portions of moose winter range and preferred crucial winter range at the lower elevations where it parallels the Clarks Fork. Human disturbance and habitat conversions associated with powerline construction would not have any measurable effect on moose populations. Tree clearing along the transmission corridor would result in minor increases in foraging habitat in portions of winter and summer range traversed by the line.

The alternative would not result in an increase in legal harvest because hunting is restricted to a specific harvest quota as determined by the Montana Department of Fish, Wildlife and Parks (MDFWP). Increased use and access of the area may result in additional harvest due to accidental shootings or illegal harvest.

Scenario B-1 eliminates the potential for mining-related impacts on at least 17,760 acres of federal land. Existing habitat and levels of access are not likely to change as a result of mining. However, effects related to increased traffic, snowplowing, and increased human population as well as habitat alteration as described for Scenario A-1 would occur due to anticipated mining on private land and existing unpatented mining claims.

Scenario B-2 reduces the potential for a major mine in the area. Consequently, mining-related changes to moose habitat are unlikely, as are potential adverse effects associated with snowplowing and vehicle collisions, and increases in the human population.

Mule Deer, Elk (MIS-Custer NF)

Affected Environment

Elk are widely distributed within the Gallatin and Custer National Forests and exhibit seasonal movement in response to weather patterns. The higher elevations are used predominantly as summer range, while lower elevation areas are used for winter range. In the vicinity of the study area, elk movement to and from winter range does not occur along specific migration routes but takes place more as general patterns of movement to and from higher to lower elevation habitats. Winter range is characterized by low elevations, which in combination with southerly aspects, limits snow accumulation. Elk summering in the vicinity of the study area may belong to the Northern Yellowstone and Clarks Fork herd. Elk summer range is not a limiting factor.

A few elk are known to overwinter in winter range at the lower elevations along Soda Butte Creek in the vicinity of Cooke City (Map 3-18). This wintering area is located beyond the extreme eastern portion of the Northern Yellowstone Winter Range (NYWR). Although the number of elk wintering along Soda Butte Creek downstream of Cooke City varies from year to year depending on snow depths, the majority of elk in the northern portion of Yellowstone NP farther to the northwest in the Gardiner Basin area within the NYWR. This winter range supports one of the largest wintering populations of elk in North America. Snow conditions and topographic barriers physically precludes big game movement between the NYWR and the study area during the winter months.

According to Tom Lemke, MDFWP, (pers. comm., October 21, 1996) there is a relatively low population density of elk in the study area and summer/fall populations are estimated at 50 to 100 head. Hunting District # 316 includes a relatively broad area encompassing the study area and is open for the early hunting season (Sept. 15) and continues into the general hunting season. Harvest data for elk are not available specific to the study area.

Mule deer occupy the study area in the summer and fall, migrating to the Gardiner Basin near Gardiner, Montana, for the winter. Habitats within the study area are used solely as summer and fall range because of heavy snowfall accumulations during the winter and spring months. Summer range for mule deer is not a limiting factor. According to Tom Lemke, MDFWP, (pers. comm., October 21, 1996), mule deer densities are relatively low within Hunting District #316 in which the general season was open for antlered deer only in 1996. The study area is only a portion of HD #316.

Summary of Effects

Future mining in the area could result in direct loss of habitat due to location of facilities, and increased access due to mining-related roads. Elk are typically less tolerant of disturbance than mule deer and are more likely to be displaced from the area with increasing levels of human disturbance. Construction of a major mine could result in the construction of a powerline corridor that would traverse portions of elk and mule deer winter range at the lower elevations. Human disturbance and habitat conversions associated with powerline construction would not have any measurable effect on elk or mule deer populations. Wyoming Highway 296 passes through elk and mule deer winter ranges. Construction of a major mine in the study area would result in snowplowing to keep U.S. 212 and WY 296 open during the winter months for ore concentrate transport to Cody, Wyoming. As a result, increased traffic could increase the risk of vehicle/deer collisions during the winter months along WY 296. The magnitude of this increase is unknown, but the risk would increase with duration of the period the highway is plowed and the volume of vehicle traffic on the highway during the time elk and deer are present.

With the increased human population associated with a mine, an increase in legal hunting of elk and deer would be likely. There is an increased risk that a major mine could create new access roads into areas that were previously unroaded and secure from hunting and trapping pressure. There is a the risk of illegal kills (poaching) of elk and mule deer resulting from the increased human population.

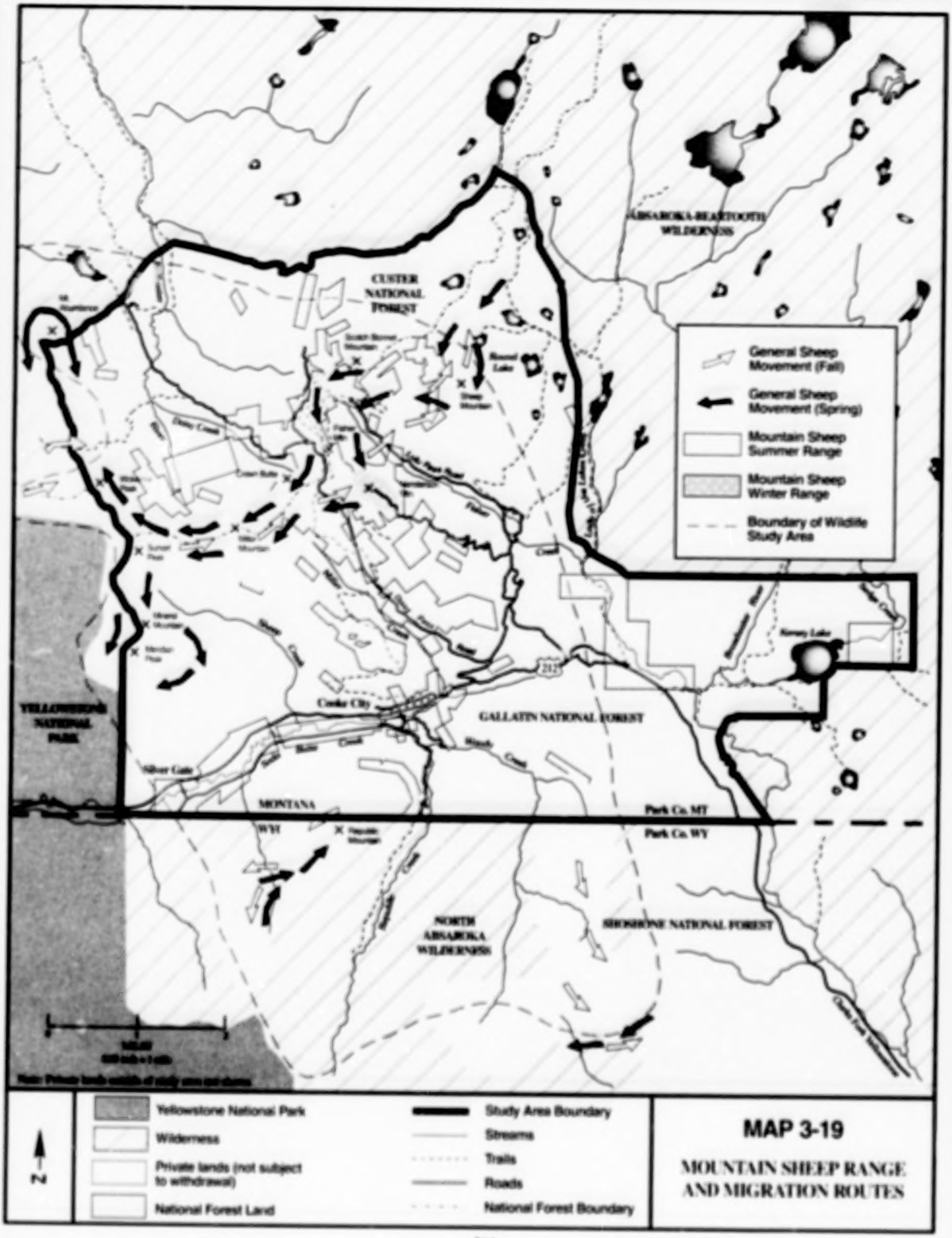
Scenario B-1 tends to maintain the existing security habitat in the study area, as most of the roadless areas are withdrawn from mineral entry. However, effects associated with increased population, snowplowing and increased highway traffic would still occur due to predicted mining on private and unpatented mining claims. Scenario B-2 results in minimal change to existing habitat, road densities, highway/big game collisions, and human population pressures.

Bighorn Sheep (Sub-Issue)

Affected Environment

The study area includes portions of summer range for at least four different bighorn sheep herds: West Rosebud (about 60 head), Rock Creek (about 40 head), Clarks Fork (about 350 head), and Soda Butte Creek (about 20 - 30 head). Animals from the West Rosebud and Rock Creek herds move through the study area to reach their summer range. Migration routes and summer ranges for the Clarks Fork herd and the remainder of the Rock Creek herd are located primarily to the south of Cooke City and Highway 212. Some animals from the Soda Butte herd that winter in Yellowstone NP move into Mount Abundance-Miller Mountain-Meridian Peak summer range. Travel routes and sheep range within the study area are displayed on Map 3-19.

Summer range for the West Rosebud herd extends generally from Henderson Peak west to Miller Mountain and Sunset Peak then south and north to Meridian Peak and Mount Abundance, respectively. These animals migrate to and from this range along the ridge from Sheep Mountain to Scotch Bonnet Mountain, then to Fisher Mountain and Henderson Mountain, and finally to Crown Butte and Miller Mountain where they disperse over their summer range. A few animals appear to remain for part of the summer on Sheep Mountain or Henderson Mountain. A portion of the Rock Creek herd (primarily rams) move west near the general study area following the same route as the West Rosebud sheep to summer range. A small number of bighorn sheep occasionally remain and overwinter atop Henderson Mountain. These animals are restricted by deep


ABSAROKA-BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Round Lake
General Sheep Movement (Fall)
General Sheep Movement (Spring)
Mountain Sheep Summer Range
Mountain Sheep Winter Range
Boundary of Wildlife Study Area
Daisy Creek
Fisher
Cooke City
GALLATIN NATIONAL FOREST
212
Silver Gate
Soda Butte Creek
Republic Creek
MONTANA
WYO
Park Co. MT
Park Co. WY
YELLOWSTONE NATIONAL PARK
NORTH ABSAROKA WILDERNESS
SHOSHONE NATIONAL FOREST
Clarks Fork Yellowstone
MILES
Note: Private lands outside of study area not shown
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary
N

MAP 3-19

MOUNTAIN SHEEP RANGE AND MIGRATION ROUTES

snow to high elevation, windswept alpine grassland habitats during the winter. The winter range area is located within the high mineral potential area.

According to Tom Lemke, MDFWP, (pers. comm., October 21, 1996) the MDFWP conducted aerial surveys in conjunction with analysis for the New World Project. The maximum number of bighorn sheep observed during the summer from the air was approximately 20 to 30 head. MDFWP Hunting Regulations show the tentative license quota of three bighorn sheep in Hunting District # 501 (3 legal rams) and 502 (closed) in 1996.

Summary of Effects

The effect of human activities on bighorn sheep habitat and populations have been evaluated for a variety of situations. Negative effects are usually attributed to direct habitat loss or withdrawal from suitable habitat as a result of human disturbance influences. Numerous studies have attributed bighorn range abandonment to a variety of human activities. Bighorn avoidance of human activity is often interpreted as a negative effect upon the animals. However, associated adverse population effects are seldom demonstrated and the meaning of avoidance behavior may be ambiguous. A considerable volume of recent literature also indicates that the influence of human presence and related industrial activities are not necessarily detrimental to bighorn sheep unless key habitat areas are affected or sheep are pursued and intentionally harassed. The reviewed studies indicate that effects of human activity on bighorn sheep populations are difficult to predict, but that bighorn sheep have the ability to acclimate to human presence and mining related actions with no observed adverse effects.

Bighorn sheep could be affected where access roads for mines would cross or parallel the existing migration route (NWP PDEIS, Wildlife Tech. Report, Tyers, Aug. 21, 1996, Figure 17, 18 and 19). Additional mining-related actions such as tailings facility, mill, and waste rock stockpile could impact bighorn sheep when located in close proximity to the migration corridor. Human activities adjacent to and along this corridor could disrupt bighorn sheep migration patterns in the area and result in displacement of animals into less suitable habitat areas or prevent their movement to and from winter and summer range. Displacement of bighorn sheep may be short-term since studies have demonstrated their ability to acclimate to mining-related actions. Facilities out of line-of-sight and over one mile from established migration routes and winter range are not likely to result in long-term displacement of bighorn sheep. Bighorn sheep range and movement corridors are located in areas of high mineral potential including Fisher and Henderson Mountain. Bighorn sheep winter range on Henderson Mountain is also located within the high mineral potential area. Development of the NWP could affect habitat in these areas.

Scenario B-1 would preclude mining on withdrawn lands which include bighorn sheep habitat in the upper Woody Creek, Republic Mountain, and the ridgeline between Mount Abundance and Meridian Peak along the western boundary of the study area. In the absence of a withdrawal, these areas are open to filing of new mining claims. With this Scenario, habitat in the Fisher Peak/Henderson Mountain area would most likely be affected as mineral development is predicted in this area on private land and existing unpatented mining claims. Activity in this area could also affect sheep travel routes across the study area.

Scenario B-2 would reduce the risk of disturbance and habitat related impacts from mining as no major mines are predicted under this Scenario.

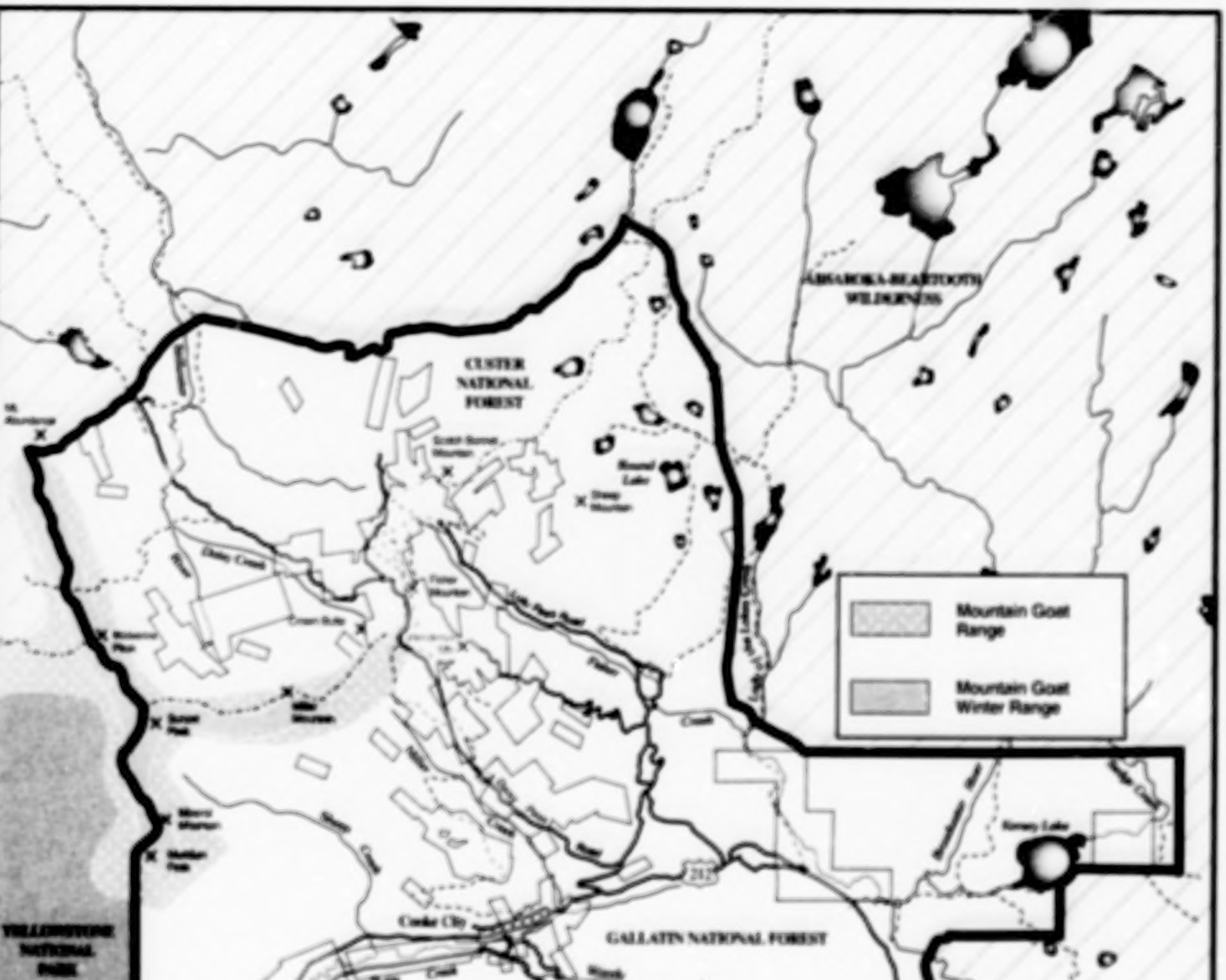
Mountain Goat (Sub-Issue)

Affected Environment

Mountain goats are a non-native species introduced in the 1950's into the Absaroka-Beartooth area. According to Shawn Stewart, MDFWP (pers. comm., October 17, 1996), the Beartooth mountains contain approximately 300 mountain goats and the population trend is static to slightly decreasing. According to Tom Lemke, MDFWP, (pers. comm., October 21, 1996) there are an estimated 25 to 35 head during the summer and the mountain goat population trend is increasing within the study area. The number of mountain goats wintering in the area is unknown. All herds within the Beartooth mountains have been hunted since 1960s except within the study area. Within the study area, two hunting permits were issued for mountain goats for the first time in 1996. Portions of the study area are occupied year-round by mountain goats (Map 3-20). Mountain goats are located primarily along the high elevation ridges connecting Miller Mountain, Mount Abundance, and Meridian Peak. Single animals apparently reside on both the Republic Mountain area south of Highway 212 and Soda Butte Creek, and on Henderson Mountain.

Summary of Effects

If a mine is developed, human activities associated with mine construction and operation have the potential to displace mountain goats from occupied habitats. Although a few studies indicate some mountain goat habituation to human activity over time, most research has indicated that human activity can displace mountain goats from portions of otherwise undisturbed habitat. Mountain goat could be impacted where access roads for mines would cross or



MAP 3-20

MOUNTAIN GOAT RANGE

parallel the existing migration route (NWP PDEIS, Wildlife Tech Report, Tyers, Aug. 21, 1996, Figure 20 and 21). Additional mining-related actions such as tailings facility, mill, and waste rock stockpile could impact mountain goat when located in close proximity to the migration corridor. Human activities adjacent to and along this corridor could disrupt mountain goat migration patterns in the area and result in displacement of animals into less suitable habitat areas or prevent their movement to and from winter and summer range. The portion of the range between Miller Peak and Crown Butte is most likely to be affected by future mining activity.

Scenarios B-1 and B-2 provide for withdrawal from mineral entry key portions of mountain goat range near Republic Mountain and along the ridge between Mount Abundance and Meridian Peak. Future mining is unlikely to affect mountain goat use of these areas. Mountain goat range between Miller Mountain and Crown Butte is likely to be affected by future development on private land and unpatented mining claims in the area under Scenario B-1. Increases in the human population associated with mineral development may lead to increased risk of illegal harvest of mountain goats.

Under Scenario B-2, no major mines are forecast for the area. Existing mountain goat habitat would not likely be affected by future mining.

Bison (Sub-Issue)

Affected Environment

Bison numbers in recent years have increased substantially within Yellowstone NP, and unusual movement patterns have been associated with this population increase. Since 1976 increasing numbers of bison have attempted to cross the west and north Park boundaries into Montana, and attempts to block this movement have been largely unsuccessful. Much of this movement has occurred along the plowed road from Tower to Mammoth. A few bison are present along Soda Butte Creek when snow conditions allow. Bison presence was recorded in the vicinity of Cooke City in late summer and early fall of 1994. Snow depth has traditionally limited winter movements of bison along unplowed portions of Highway 212 east of Cooke City. If this road is plowed, bison may migrate along plowed highways and streets from Yellowstone NP through Silver Gate and Cooke City and into the Sunlight Basin of Wyoming. This is a concern, in part, because Yellowstone bison carry the brucella bacteria. Existing use of the study area is restricted to a few bison in the late summer, early fall, and winter. Reference examples of bison movements such as the Absaroka herd pioneering new range via groomed snowmobile trails and plowed roads during the winter (National Park Service, Feb., 28, 1996; and Meagher, Sept. 12, 1994).

Summary of Effects

A major mine would require the snowplowing of U.S. 212 and WY 296 to keep them open during the winter months for ore concentrate transport to Wyoming. Snowplowing of this portion of highway could provide a migration route for bison wintering in the Lamar Valley to move out of Yellowstone NP and into lower elevation areas of northwest Wyoming. Movement into northwest Wyoming would require winter bison travel from the Cooke City area over Colter Pass and through several miles of forested and other habitats with no available forage due to heavy snow cover. This type of movement would be unusual, but not impossible, since movement patterns of similar magnitude have been documented for bison moving from the Park into southwest Montana (Meagher, 1988). This potential movement corridor would not have any direct effect on bison populations in Yellowstone NP. Bison movement out of Yellowstone NP during the winter into previously unoccupied areas of northwest Wyoming, however, has implications with regard to potential conflicts with private lands in Wyoming, including damage to fences, consumption of hay, occasional hazard to people and vehicle traffic, and possible transmission of brucellosis to cattle. Potential conflicts may also result in bison mortality resulting from collisions with vehicles and government control actions.

With Scenario B-1, projected development would result in snowplowing of US 212 thus increasing the risk of bison migration into the Sunlight Basin. Scenario B-2 reduces the likelihood of a major mine and the subsequent need to snowplow US 212. The likelihood of bison migration during the winter is reduced.

Additional Management Indicator Species Analysis

The CCAMW Wildlife Technical Report (Sasse, Nov. 29, 1996) includes an analysis of additional management indicator species that may be present in the study area. Refer to this report for a description of the affected environment and environmental effects on Northern Goshawk, Marten, Golden Eagle, and Prairie Falcon.

Additional Sub-issues Analyzed

The CCAMW Wildlife Technical report (Sasse, Nov. 29, 1996) includes an analysis of neo-tropical migratory birds, risk of toxic material to wildlife, and noxious weeds.

Conclusion

Scenario A-1 would provide the maximum amount of land available for future mining. Mineral development anticipated for this Scenario would result in the highest potential for habitat disturbance, additional road access and traffic, and increases in local human population. The potential impact from mining-related actions could occur on all ownerships in the approximately 26,160 acres available for mining-related actions within the study area. Changes in population, recreation, and tourism could also affect habitat regardless of whether mining activities occur in the project area. Under Scenario A-2, the NWM Agreement significantly reduces the potential for future mines as the area of highest development potential is no longer available. However, the 17,820 acres of federal land open to mineral entry consists of the generally unroaded and undeveloped lands in the study area. Any development of these lands could result in a decrease in security habitat for several species. The effects previously described under Scenario A-1 could also occur under this scenario if a major mine is developed.

The risks of direct, indirect, and cumulative effects (past, present, and reasonably foreseeable actions) for Scenario B-1 would be similar to Scenario A-1 due to anticipated development of the New World Project. The area of highest mineral potential remains available for mining. The mineral withdrawal would affect 17,760 acres of federal lands which generally consists of undeveloped and unroaded lands. Scenario B-2 presents the least potential for habitat changes, increases in local human populations, effects associated with increased traffic, and other mining-related impacts. No major mines are forecast under this Scenario.

REQUIRED DISCLOSURES

Energy Requirements

There are minimal energy requirements related to determining which lands would be administratively withdrawn from mineral entry. Subsequent activities such as exploration and development could involve substantial expenditures of energy and would be considered at the permitting stage for mine development. Expenditures of energy would be expected to increase with higher levels of mining and or recreation use. However, the energy required to implement the action alternatives, in terms of petroleum products, is insignificant considering national and world-wide petroleum resources.

Short-term Use vs. Maintenance and Enhancement of Long-term Productivity

Short-term uses are those uses that generally occur annually. Long-term productivity refers to the ability of the land to produce a continuous supply of a resource. A mineral withdrawal would affect short-term uses related to mining. A mineral withdrawal helps maintain the long-term productivity of the land due to limitations on future mining.

Irreversible and Irretrievable Commitment of Resources

An irreversible commitment of resources results from a decision to use or modify resources that are renewable only over a long period of time. Nonrenewable resources such as minerals, are an irreversible commitment if used. An irretrievable commitment of resources refers to resources, resource production or the use of renewable resources that are lost because of land allocation or scheduling decisions.

A decision on whether to withdraw federal lands in the Cooke City area from mineral entry will not result in any irreversible or irretrievable commitment of resources. Under the proposed action, up to 22,000 acres of federal land would be withdrawn from locatable hardrock mineral entry. This action has certain effects which are described throughout this chapter, including an economic opportunity foregone, but these are not irreversible or irretrievable commitments because the mineral resource remains on site and the withdrawal could always be revoked.

Under the no action alternative, federal lands would not be withdrawn and therefore they would remain open and available for mineral entry. Although the projected consequences of this alternative are based on a mineral forecast, this is not a decision to permit mineral exploration or development. Any commitment of resources would not occur until such time that a decision is to be made on a mining proposal.

Possible Conflicts with Plans and Policies of other Jurisdictions

No conflicts with other Jurisdictions are anticipated as a result of the mineral withdrawal.

Probable Adverse Environmental Effects That Cannot be Avoided

Implementation of a mineral withdrawal will not result in adverse environmental effects that cannot be avoided. Reclamation of disturbed sites would continue with a mineral withdrawal.

Lack of federal lands for mining-related facilities could result in less environmentally preferred development on private land, depending on the size and location of a future mineral activity.

Critical Elements of the Human Environment

Elements that are subject to requirements specified in statute, regulation, or executive order that are addressed throughout Chapter 3 include air quality, cultural resources, floodplains, Native American religious concerns, threatened or endangered species, hazardous wastes, water quality (drinking/ground water), wetlands/ riparian zones, wild and scenic rivers, and wilderness. Other elements that would not be affected because they do not exist in the study area include designated Areas of Critical Environmental Concern and prime or unique farmlands.

Environmentally Preferred Alternative

Alternative B, Mineral Withdrawal, is the environmentally preferred alternative. This alternative causes the least damage to the biological and physical environment, and best protects, preserves and enhances historic, cultural and natural resources.

Environmental Justice

During the course of this analysis, no alternative considered, resulted in any identifiable effects or issues specific to any minority or low income population or community. The agencies have considered all public input from persons or groups regardless of age, race, income status, or other social/economic characteristics.

The race and Hispanic origin of the population of the two counties within the study area are displayed in Table 3-18. Neither the proposed action nor mining activity would be expected to result in any significant change in these demographics. If mining were to occur, there would likely be a small change in the relative size of the age groups present in the area. The 1990 Census reported that 25.3 percent of the population of Park County, MT was under the age of 18 and 15.7 percent was over the age of 65. Within Park County, WY 28.1 percent of the population was under age 18 and 13.3 percent was over age 65. If mining were to occur, the majority of immigrants would fall within the 18 to 65 age group. However, since the county-wide population impacts would be relatively small, the effect on the relative size of population age groups would not be significant.

For those persons for whom poverty status was determined, the 1990 Census revealed that 15.3 percent of the population in Park County, MT and 9.5 percent of the population in Park County, WY were below the poverty level. The proposed action would have little effect on these persons. Potential mine development under the no action alternative would provide an increase in the number of higher paying jobs available for area residents to apply for, thereby increasing the potential for some low income individuals to improve their standard of living.

CHAPTER 4
CONSULTATION AND COORDINATION

SUBSTANTIVE CHANGES BETWEEN THE DRAFT EIS AND THE FINAL EIS

A new subsection entitled "Release of the Draft EIS" which summarizes the efforts to ensure that the public was aware of the availability of the Draft EIS was added.

A new subsection entitled "Meetings on the Draft EIS" which summarizes when and where meetings on the Draft EIS were held was added.

Information was added to the subsections entitled "Congressional Delegations" and "State, County, and Local Government" to document continuing efforts to keep elected officials informed about the progress of the CCAMW process.

The "CHRONOLOGY OF PUBLIC PARTICIPATION ACTIVITIES (AGENCIES AND GENERAL PUBLIC)" was modified to include the activities that have occurred since the Draft EIS was released to the public.

A section entitled "PUBLIC COMMENT ON THE DRAFT EIS" which discusses the content analysis procedures, the demographic distribution of the commentors, and the comment summary process was added. A list of commentors and a brief summary of the public comments is also presented, followed by the full-text letters from other agencies and elected officials and the agencies' responses to the substantive comments in these letters.

A list of individuals, other agencies, Tribes and elected officials that are on our mailing list to receive a copy of the Final EIS/Summary is included in the section entitled "DISTRIBUTION OF THE EIS".

"APPENDIX I, PUBLIC COMMENT ON DRAFT EIS AND AGENCIES' RESPONSE," was also added to the Final EIS.

EXTERNAL - GENERAL PUBLIC

Project Initiation and Initial Scoping

The Department of the Interior published a "Notice of Proposed Withdrawal: Montana" in the *Federal Register* on September 1, 1995. In this Notice, the Secretary of the Interior proposed a 20-year withdrawal of federal locatable minerals on up to 19,100 acres near Cooke City, Montana. For a two-year period, no new mining claims could be filed on federal lands. Unpatented mining claims on federal lands remain subject to valid existing rights and could be developed. The withdrawal (as originally proposed) would not be applied to private lands acquired by the United States.

The lead agencies (Forest Service (FS) and Bureau of Land Management (BLM)) published an initial "Notice of Intent to Prepare a National Environmental Policy Act (NEPA) Analysis for a proposed mineral withdrawal in southwestern Montana" in the *Federal Register* on May 31, 1996. A news release was issued to area newspapers on June 7, 1996, describing the project; announcing dates for public scoping meetings in Red Lodge, Cooke City, and Livingston, Montana, and Cody, Wyoming; and asking the public to identify issues and concerns about the proposed Cooke City Area Mineral Withdrawal (CCAMW).

During the week of June 10, 1996, CCAMW team co-leaders from the FS and BLM telephoned known area claimholders, representatives of environmental organizations and the mining industry, offices of State government, and other persons who were known to have interests in the Cooke City area. These calls were intended to let these parties know that the agencies were initiating the proposed mineral withdrawal process for the Cooke City area, alert them to the time frames projected, solicit their participation, and encourage them to let others know about the process and how they, too, could become involved.

An "interested party" letter was sent to over 1,000 individuals and organizations on June 14, 1996. For the initial mailing, the CCAMW team used a mailing list compiled by the Gallatin National Forest for the New World Mine project and added names of others who had previously expressed interest in projects that occurred in the Beartooth Mountain Range. The "interested party" letter announced the scoping meeting dates and times and requested that those who wanted to be retained on the mailing list for the proposed mineral withdrawal project return an enclosed mailer confirming their correct mailing address.

On June 19 the CCAMW team co-leaders provided a briefing on the proposed Cooke City Area Mineral Withdrawal process to members of the Montana Mining Association. On June 28 the team co-leaders provided a similar briefing for a group of members of environmental organizations (Montana Environmental Information Association, Beartooth Alliance, Sierra Club Legal Defense Fund, and Greater Yellowstone Coalition).

On July 8, a news release was issued to area news media to remind the public of the upcoming scoping meetings.

A scoping letter was sent to over 500 people who had requested to be placed on the mailing list for the CCAMW on July 10, 1996. This letter provided additional information about the project; confirmed the dates, times and locations of the upcoming scoping meetings; and asked the recipients to submit any issues or concerns they might have about the proposed mineral withdrawal or any information they might have about resources or uses within the withdrawal area.

Scoping Meetings

The public participation process got underway the week of July 15, 1996, with the four public meetings held in Red Lodge, Cooke City, Cody, and Livingston.

Handouts available to the public at the meeting included a copy of the scoping letter, a brief synopsis of the mining laws, a list of "Key Terms and Concepts" that were being used in the process, a copy of "Questions and Answers Regarding the Proposed Cook City Area Mineral Withdrawal," and a "Comment Form" that could be filled out at the meeting or be used to submit comments to the team at any time during the scoping process. A Proposed CCAMW location map was included with the scoping letter.

At the scoping meetings, the CCAMW team co-leaders from the FS and BLM provided background information, including description of the purpose for this proposed withdrawal and a synopsis of the analysis process. A brief overview of the preliminary issues that had been identified by the public and the interdisciplinary team was presented for consideration by attendees. These issues included:

- Proximity to Yellowstone National Park and the Absaroka- Beartooth Wilderness,
- Grizzly bear habitat,
- Impacts to private property,
- Water quality and quantity,
- Impact on possible millsites and potential loss of mineral sources,
- Maintenance of quality of life, and
- Economic impact of the withdrawal.

The team co-leaders also presented the alternatives tentatively being considered for analysis. One member of the interdisciplinary team also discussed the mining laws and described what a mineral withdrawal does. Following the presentations by the CCAMW interdisciplinary team members, the audience was asked to participate by identifying any issues or concerns they would like to have addressed in the analysis process or any alternatives that should be considered. The issues expressed by the audience were recorded on a "group memory" flipchart for reference by the CCAMW team.

Public attendance at the scoping meetings was as follows:

Date	Meeting Location	Attendance
July 15	Red Lodge, MT	45
July 16	Cooke City, MT	105
July 17	Cody, WY	35
July 18	Livingston, MT	55

The "formal" scoping period (90 days from publication of the Notice of Intent filed in the *Federal Register*) ended on August 29, 1996. Approximately 150 written responses were received from the public during the scoping period.

New World Mine Agreement, Modified Proposal, and Extended Public Scoping

On August 12, 1996, President Clinton announced that an agreement between Crown Butte Mines, Inc.; the Greater Yellowstone Coalition, *et al.*; and the United States of America, had been reached. The Agreement provided for a halt to development of the New World Project and for federal acquisition of Crown Butte's property interests, including private mineral estate and unpatented mining claims, in the vicinity of the proposed CCAMW. To meet the intent of this Agreement, the purpose and need for the CCAMW was expanded to include any property interests the federal government might acquire as a result of the NWM Agreement. Approximately 40 additional responses were received during the extended scoping period. Issues raised during public scoping are discussed in Chapter 1.

On September 20, 1996, a notice of "Amendment to Proposed Withdrawal; Montana" was filed in the *Federal Register*, notifying the public that the BLM, with concurrence from the FS, had amended the petition and application for the proposed CCAMW to withdraw up to 22,000 acres of federal minerals from mineral entry for a period of 20 years. The modifications include withdrawal of any private lands and minerals that might be acquired in the study area in the future, either as a result of the NWM Agreement or from other willing sellers; acquired leasable hardrock minerals that otherwise would be open to leasing under the mineral leasing laws; and a 2,960-acre area encompassing Kersey Lake. Public comments on the project modifications were requested by December 19, 1996.

Based on public comments received in earlier scoping efforts, the BLM and FS decided to prepare an Environmental Impact Statement (EIS) to display the effects of the proposed mineral withdrawal. The "Notice of Intent to Prepare an Environmental Impact Statement" was published in the *Federal Register* on September 27, 1996.

On September 30, 1996, the lead agencies sent a letter to approximately 700 people on the mailing list. This letter:

- provided an update on the process,
- described why and how the CCAMW proposal had changed as a result of the New World Mine Agreement,
- confirmed that an EIS would be prepared,
- gave a list of the issues that would be addressed in the EIS,
- described the two alternatives that would be analyzed in detail ("No Action" and "Proposed Action"),
- displayed the alternatives that had been considered but dismissed from detailed analysis, and
- announced future public involvement opportunities.

On October 1, 1996, the CCAMW team co-leaders made a presentation to the Cooke City Chamber of Commerce, providing a description of the modifications in the Purpose and Need for the Withdrawal and in the Proposed Action. They also discussed the issues and concerns that had resulted from the first scoping period and the alternatives that were currently being considered in the analysis process.

The lead agencies held two additional scoping meetings to determine whether or not there were any further issues that had arisen, based on the project modifications. The meetings were held in:

•Cody, Wyoming, on October 23, 1996 (12 attended)

•Livingston, Montana, on October 24, 1996 (24 attended)

The meetings followed an open house format where CCAMW team co-leaders and other team members were available to answer any questions about the withdrawal analysis. The open house format was used to provide the public with one-on-one contact with the team members in order that they might be able to more fully explore questions and concerns. Maps were displayed to provide a better visualization of how each of the areas would be addressed (withdrawn/not withdrawn) in each alternative.

To ensure that no "immediately affected" individuals had been missed in the scoping process, on October 28, 1996, the lead agencies issued a letter to 383 people who were identified as owning property within the study area. This letter provided background on the project, issues, and alternatives; an update on the analysis; and an invitation to be involved in the process.

Release of the Draft EIS

On March 14, 1997, the Environmental Protection Agency and the Bureau of Land Management published Notices of Availability of the Draft EIS in the Federal Register (Volume 62, Number 50, pages 12181 and 12248). These notices specified the comment period and who to contact concerning questions. The notices also announced public meetings in Cooke City, Livingston, and Red Lodge, Montana, and Cody, Wyoming.

Two press releases were issued in March, 1997. The first, issued on March 6, announced the release of the Draft EIS and Summary and described the dates and locations of public meetings on the Draft EIS. The second, issued on March 21, again announced the upcoming meetings that were scheduled for early April. These press releases were sent to local and regional media contacts. Stories were carried by media in Billings, Livingston, Cody, and Powell.

Briefing packets, which included a copy of the Draft EIS, the Summary, a briefing paper, a copy of recent press releases, and a copy of questions and answers about the Proposed Mineral Withdrawal and the Draft EIS, were also made available to the media in early March.

The comment period on the Draft EIS closed on April 28, 1997. Nearly 900 copies of the Draft EIS and/or the Summary of the Draft EIS were mailed to individuals, groups, agencies, government officials, and the media.

Meetings on the Draft EIS

Four public meetings were held to allow the public to express concerns and ask questions concerning the Draft

EIS. Each meeting was conducted in an "open house" format that was open from 4 p.m. to 8 p.m. The objective was to allow the public greater opportunity to gain information and background concerning the alternatives and to share their concerns and any factual information with the CCAMW team.

Public attendance at the meetings was as follows:

Date	Meeting Location	Attendance
April 2	Cooke City	22
April 3	Livingston	32
April 9	Cody	26
April 10	Red Lodge	22

Team co-Leaders were invited to speak to the Billings Natural Resources Roundtable on April 8, 1997. At the meeting, they briefly summarized the Draft EIS, explained the comment period, and discussed issues and concerns related to the Draft EIS and the Proposed Withdrawal.

EXTERNAL - ELECTED OFFICIALS, AMERICAN INDIAN TRIBES

Congressional Delegations

The CCAMW team began contacting the Wyoming and Montana Congressional delegations to provide briefings via telephone with delegation staffs for Senators Craig Thomas and Alan Simpson and Congresswoman Barbara Cubin of Wyoming during the week of June 10-14, 1996. The team also visited with Billings staff members for Montana Senators Max Baucus and Conrad Burns on June 18 and June 20, respectively, to provide briefings on the withdrawal proposal and the process. The preliminary public mailing announcing the project and a briefing paper describing the project were FAXed to Congressman Pat Williams' Billings office on June 18 and a member of his staff attended the briefing with Senator Baucus' staff. On July 17, the team met with Wyoming Senator Simpson's staff to provide a briefing. The other two Wyoming congressional offices were invited to the briefing, but were unable to attend. On September 26 and 27, respectively, the CCAMW team again visited with Senators Burns' and Baucus' staff members to update them on the project and to discuss the amendment to the proposed withdrawal as a result of the NWM Agreement. Senator Burns' staff requested and was provided with budget information for the CCAMW process on October 10, 1996. The Wyoming congressional delegation members were provided with a briefing and a report on the progress of the analysis in Cheyenne, WY, on November 26, 1996 by CCAMW team co-leaders.

The EIS Team Leaders again briefed the Montana Congressional Delegations in early March, 1997. On March 7, the Congressional staffs in Billings for Senator Baucus, Senator Burns, and Congressman Hill were provided copies of the Draft EIS and briefing packets. A briefing for the Wyoming Congressional Delegation also occurred in early March in Cheyenne, Wyoming. Congressional staffers for Senators Thomas and Enzi and Congresswoman Cubin were provided briefing packages which included copies of the Draft EIS.

State, County, and Local Government

On June 12, the CCAMW team contacted the Montana Department of Department of Environment Quality (DEQ) to provide information regarding initiation of the CCAMW study by the FS and BLM. The Governors' Offices in Helena, MT, and Cheyenne, WY, were included in the initial public mailing of CCAMW information (June 14, 1996); they have been included in all subsequent public mailings.

The Montana State Historic Preservation Office (SHPO) was contacted by the FS on September 17, 1996, to solicit comments on the mineral withdrawal project. The SHPO acknowledged this contact on September 24, 1996.

On October 8, 1996, the CCAMW team went to Helena to brief officials from the Montana DEQ on the withdrawal proposal and changes to the proposal as a result of the NWM Agreement.

The Wyoming Governor's Office hosted the briefing for Wyoming State officials and the congressional delegation in Cheyenne, WY, on November 26, 1996.

The CCAMW team contacted the County Planner for Park County, MT, on June 13, 1996, to provide information about the CCAMW project. County Commissioners of Carbon, Park, Gallatin, Stillwater, Sweet Grass, and Yellowstone County, MT, and Park County, WY, were included in the initial public mailings of information about the CCAMW project (June 14, 1996).

Montana and Wyoming State Offices and County Commissioners were invited to attend an interagency scoping meeting held in Billings on July 25, 1996. Those included in the invitation to the States and Counties were as follows:

- Montana Governor's and Lieutenant Governor's Offices
- Montana Department of Environmental Quality
- Montana Department of Fish, Wildlife, and Parks

- Montana Department of Natural Resources and Conservation
- Montana Department of Commerce
- Montana State Historic Preservation Office
- Wyoming Governor's Office
- Wyoming Game and Fish
- State of Wyoming, Department of Environmental Quality
- Wyoming State Planning Coordinator's Office
- Carbon County (MT) Commissioners
- Park County (MT) Commissioners
- Stillwater County (MT) Commissioners
- Sweet Grass County (MT) Commissioners
- Gallatin County (MT) Commissioners
- Yellowstone County (MT) Commissioners
- Park County (WY) Commissioners

Included with the letter of invitation was an updated briefing on the process and a request for agencies to identify concerns that they may have for consideration in the CCAMW process.

County Commissioners in three counties were briefed to provide a summary of the Draft EIS, to provide an update on the status of the Draft EIS, and to hear concerns and answer questions from the Commissioners. The Sweet Grass County Commissioners were briefed on March 5, 1997, with a conference call; on March 11, 1997, the Park County, Wyoming County Commissioners were briefed in Cody; and Park County Montana County Commissioners were provided a similar briefing in Livingston, Montana on March 18, 1997.

Approximately 50 Montana State Legislators from the area affected by the proposed mineral withdrawal also received briefing packets which included a Summary, a briefing paper, and questions and answers about the Draft EIS. These were hand delivered at the legislative session in Helena between March 7 and March 14, 1997.

A letter and briefing packets were delivered to Wyoming Governor Jim Geringer's staff and Montana Governor Marc Racicot's staff in early March, 1997. The packets included copies of the Draft EIS, the Summary, a briefing paper, a copy of recent press releases, and questions and answers about Proposed Mineral Withdrawal and the Draft EIS. Also included in this packet was a list of public meetings, their dates, and locations.

On March 13, 1997, members of the CCAMW core team went to Helena to brief officials from various Montana State Government agencies. Agencies represented included Montana Department of Environmental Quality, Montana Department of Fish, Wildlife, and Parks, and the Governor's Office. The team summarized the Draft EIS, discussed opportunities for public comment, and reviewed the schedule for preparation of the Final EIS with meeting attendees.

Agencies of the Montana and Wyoming State Governments and the "affected counties" received copies of the Draft EIS. Letters of comment were received from the Office of the Governor, State of Wyoming, The Montana Historical Society: State Preservation Office, and the County Commissioners from Park County, Montana, and Park County, Wyoming. These letters and responses to them (as appropriate) are printed in this chapter following the "Summary of Public Comment."

American Indian Tribes

Two American Indian Tribes were initially identified as potentially having interests in the CCAMW area, the Crow Tribe and the Shoshone Bannock Tribe. These tribes were included in the initial public mailing of information about the CCAMW project (June 14, 1996), and were invited to the interagency scoping meeting held in Billings on July 25, 1996.

Subsequently, contacts were made by letter and by telephone with five American Indian Tribes who are known or thought to have occupied or used the study area in the past. These are the Shoshone Bannock Tribe at Ft. Hall, ID; the Shoshone at Ft. Washaki, WY; the Crow at Crow Agency, MT, the Araphoe; and the Northern Cheyenne at Lame Deer, MT.

No traditional cultural sites were reported in the study area, either in telephone conversations or by letter. None are listed in the records of the State Historic Preservation Office.

INTERNAL - CO-LEAD AND OTHER FEDERAL AGENCIES

The co-lead agencies for the EIS are the U.S. Department of Agriculture, Forest Service (FS) and the U.S. Department of the Interior, Bureau of Land Management (BLM). The agencies used an interagency interdisciplinary team (including members from the Northern Regional Office of the FS; the Custer, Gallatin, Flathead, Kootenai and Clearwater National Forests; and the BLM Montana State Office) to prepare the analysis documented in this EIS.

The CCAMW team began "scoping" of other Federal agencies in June, 1996. Preliminary information about the project was given to the Office of Environmental Policy and Compliance, the Environmental Protection Agency (Denver), the United States Geological Survey, and the National Park Service. In telephone contacts during June and July, agency representatives were asked if there were any concerns they wanted to have addressed in the analysis. On July 17, 1996, a letter was sent to 35 Federal, state, and local agencies and tribal governments inviting them to attend an "agency scoping meeting" which was held on July 25, 1996, in Billings. Federal agencies included in this invitation were as follows:

- U.S. Fish and Wildlife Service (Helena, MT)
- National Park Service (Geological Resources Div., Lakewood, CO)
- National Park Service (Yellowstone National Park)
- U.S. Geological Survey (Denver, CO)
- U.S. Bureau of Reclamation (Billings, MT)
- Army Corps of Engineers (Planning Div., Omaha, NE)
- Environmental Protection Agency (Helena, MT)
- Office of Environmental Policy (Denver, CO)

The letter to these agencies also invited "any agency concerns, issues or relevant data" that agencies would like to provide for the scoping process. U.S. Fish and Wildlife and the National Park Service were able to have representatives attend the meeting.

Although not formal cooperating agencies (i.e., having signed a Memorandum of Understanding regarding the preparation of this EIS), the U.S. Geological Survey has provided data used in the analysis process and the U.S. Fish and Wildlife Service (USF&WS) has provided a list of federally listed species that may occur within the proposed CCAMW project. USF&WS has also provided information regarding the management of wolf populations in this area and has issued a Biological Opinion addressing Federally listed species as they are affected in the lead agencies' preferred alternative.

The U.S. Fish and Wildlife Service, U.S. Geological Survey, National Park Service, Environmental Protection Agency, United States Department of Justice, and Council on Environmental Quality, were included in a federal interagency review of a preliminary Draft EIS (DEIS) before this document was finalized for public release. Comments from these agencies were considered, and suggestions for improving the document were utilized, where appropriate, in the DEIS.

The Draft EIS was also sent to these federal agencies. Copies of letters from the U.S. Geological Survey, National Park Service, Environmental Protection Agency, and the U. S. Army Corps of Engineers, and responses to these letters, is published in this Chapter following the "Summary of Public Comments." The response from the U.S. Fish and Wildlife Service was a concurrence with the "Biological Assessment" and required no response. That letter is printed in Appendix E, "Biological Assessment," of this document.

CHRONOLOGY OF PUBLIC PARTICIPATION ACTIVITIES

1995

Sept 1	*Federal Register* Notice of Proposed Withdrawal : Montana

1996

May 31	*Federal Register* Notice to prepare an Environmental Analysis and public meetings.
June 7	News Release announcing start of project.
June 10	Week of June 10, telephoned initial key contacts, claim holders, environmental organizations, mining industry representatives, MT and WY State government contacts.
June 14	Letter to more than 1,000 people announcing project.
June 18	Interviewed by Bureau of National Affairs, for Daily Env. Report.

	Briefed Senator Max Baucus' staff (Sharon Peterson) and Congressman Pat William's staff (George Parisot)
June 19	Met with Montana Mining Association.
June 20	Briefed Senator Burns' Staff (Kathy Sparr).
June 28	Briefed representatives from Greater Yellowstone Coalition, Northern Plains Resource Council, Sierra Legal Defense Fund, Montana Environmental Information Center.
July 8	Issued News Release announcing meetings to media.
July 10	Scoping letter sent to complete mailing list, including Montana and Wyoming State government officials.
July 15	Red Lodge meeting (45 attended).
July 16	Cooke City meeting (105 attended).
July 17	Cody meeting (35 attended).
	Briefed Wyoming Senator Simpson's Staff (Karen McCreery).
	Letter to other NF and BLM Offices, Federal and State agencies, Indian Tribes, County Commissioners announcing interagency/intergovernmental scoping meeting to be held July 25, 1996.
July 18	Livingston Meeting (55 attended).
July 25	Agency scoping meeting attended by representatives from National Park Service; U.S. Fish and Wildlife Service; Montana Fish, Wildlife and Parks; Montana Department of Fish, Wildlife and Parks; Gallatin National Forest; Montana State Office, BLM; Custer National Forest; and Park County, Montana.
Aug 5	Letter to tribes requesting comments and concerns by September 6.
Aug 8	Provided initial telephone briefing about project to Crow Tribe Official and solicited response regarding concerns about the effect of the project on any traditional Crow cultural properties in the study area(John Pretty On Top, Crow Cultural Committee).
	Provided initial telephone briefing about project to Shoshone Bannock Tribe Official (Randy Thompson, Cultural Committee).
Aug 19	Telephone discussion with Shoshone Bannock Tribe Official (Diana Yupe) to answer questions about the project, and to solicit response regarding concerns about the effects of the proposed project on any traditional Shoshone Bannock cultural properties in the study area.
	Contacted Shoshone Tribe (Ivan Posey) to provide initial briefing about the proposed withdrawal and to solicit response regarding concerns about effect of the project on traditional Shoshone cultural properties in the study area.
	Contacted Arapho Tribe (Francis B. Brown, Arapaho Cultural Committee) to provide a briefing about the proposed withdrawal project and to solicit response regarding concerns about the effect of the projects on traditional Arapaho Tribe cultural properties in the study area.
Sept 20	Notice of Amendment to Proposed Withdrawal.
Sept 26	Briefed Senator Burns' Office (Dwight McKay).
Sept 27	Briefed Senator Baucus' Office (Marilyn Kramer).
	Phoned Jim Magagna, Wyoming Director of Federal Land Policy; Offered to brief Wyoming State Government officials.
	Federal Register Notice of meetings and Notice Of Intent to prepare an EIS.
Sept 30	Letter to approximately 700 people, giving update on status and announcing meetings.
Oct 1	Briefed Cooke City Chamber of Commerce.
Oct 8	Briefed officials from Montana Department of Environmental Quality. Provided a phone briefing of Senator Simpson's staff and Congresswoman Cubin's staff.

Oct 10	Responded to request for budget information from Senator Burns' staff (Dwight McKay).
Oct 11	News Release announcing meetings and current status.
Oct 13	Open House in Cody (12 attended).
	Letter to 383 property owners within the withdrawal study area providing background and update.
Oct 24	Open House in Livingston (24 attended).
Nov 18 -26	Letters to Yellowstone National Park, USGS, USF&WS, EPA, and CEQ inviting their participation in the review of the PDEIS.
Nov 26	Briefed Wyoming Congressional delegation, key staff members, Jim Magagna (WY Commissioner of Public Lands), and others from WY state government.
Dec 10	Washington, D.C., briefing for Environmental Protection Agency, Bureau of Land Management, Department of Justice, Department of Agriculture, Department of the Interior, and Forest Service.
1997	
Jan 1	Federal Interagency review of Preliminary Draft EIS by Yellowstone National Park, EPA, CEQ, DOJ, USFS, BLM, USF&WS, NPS, USGS.
Feb 18	Briefed Regional Forester and staff at the Regional Forester's Office in Missoula, MT.
March 5	Briefed Sweet Grass County Commissioners.
March 6	Sent letters and briefing packets to Governor Racicot, Governor Geringer, Senators Burns, Baucus, Thomas, Enzi, Congressman Hill, Congresswoman Cubin, and Key Montana legislators.
March 7	Briefed Montana Senators Baucus' and Burns' staffs in Billings.
	Briefed Montana Congressman Hill's staff in Billings.
	Issued a press release announcing the availability of the Draft EIS and public meetings.
March 10	Briefed Wyoming Senators Thomas' and Enzi's and Wyoming Congresswoman Cubin's staffs in Cheyenne.
	Delivered a briefing packet to Wyoming Governor Geringer's staff.
	Delivered a briefing packet to Montana Governor Racicot's staff.
March 11	Briefed Park County, Wyoming County Commissioners.
March 13	Briefed officials from the Montana Department of Environmental Quality, Fish Wildlife, and Parks, and the Governor's Office.
March 14	Federal Register Notice of Availability and Notice of Public Meetings.
March 18	Briefed Park County, Montana County Commissioners.
March 21	Issued a press release announcing upcoming public meetings.
April 1	Briefed BLM employees at the Montana State Office.
April 2	Held public open house in Cooke City (22 attended).
April 3	Held public open house in Livingston (32 attended).
April 8	Spoke at the Natural Resources Roundtable (Billings).
April 9	Held public open house in Cody (26 attended)
April 10	Held public open house in Red Lodge (22 attended)
April 28	End of public comment period for the Draft EIS.
May 7	Briefed Regional Forester and staff at Regional Forester's Office in Missoula, MT.
May 28	Briefed Associate State Director and Staff at BLM Montana State Office, Billings, MT.

DISTRIBUTION AND REVIEW OF THE DRAFT EIS

Distribution

Copies of the Draft EIS (or the DEIS Summary) were mailed to over 900 persons, groups, local governments, and agencies that have expressed an interest in the project. The mailing list was compiled using the names and addresses from the following sources:

- Parties who requested to have their names placed on the mailing list for the project;
- Parties who have participated at meetings and/or who have submitted written comments to date in the process;
- Federal and State agencies consulted during the preparation of the EIS; and
- other Federal, State, and local (to the study area) entities potentially affected by the proposed withdrawal.

Copies of the Draft EIS were also made available for review at the following locations for those who did not receive the documents directly:

- Northern Region Office, U.S. Forest Service, Missoula, Montana
- Bureau of Land Management, Montana State Office, Billings, Montana
- Bureau of Land Management, Wyoming State Office, Cheyenne, Wyoming
- Bureau of Land Management, Worland District Office, Worland, Wyoming
- Bureau of Land Management, Cody Resource Area Office, Cody, Wyoming
- Custer National Forest, Supervisor's Office, Billings, Montana
- Gallatin National Forest, Supervisor's Office, Bozeman, Montana
- Helena National Forest, Supervisor's Office, Helena, Montana
- Beartooth Ranger District Office, Red Lodge, Montana
- Big Timber Ranger District Office, Big Timber, Montana
- Gardiner Ranger District Office, Gardiner, Montana
- Livingston Ranger District Office, Livingston, Montana
- Shoshone National Forest, Supervisor's Office, Cody, Wyoming
- Clark Fork Ranger District Office, Powell, Wyoming
- Environmental Protection Agency, Denver, Colorado
- Yellowstone National Park, Mammoth, Wyoming
- Local public libraries in Billings, Bozeman, Livingston, and Red Lodge, MT, and Cody and Powell, WY.

Copies of the Final EIS also will be made available at the offices and libraries listed above.

PUBLIC COMMENT ON THE DRAFT EIS

Summary Information

The official public comment period for the Draft EIS closed on April 28, 1997. The team received 208 written comments that met the deadline. A handful of letters arrived after the April 28 postmark.

On receipt by the Cooke City Area Mineral Withdrawal (CCAMW) Team, each public comment was recorded and given a unique "tracking number." Copies of the letter were then sent to the interdisciplinary team members for their consideration in preparation of the Final EIS. Copies of all letters were sent to the officials responsible for the preparation of the EIS (Supervisors of the Gallatin and Custer National Forest, the Northern Region of the Forest Service, and the Montana State Director of the Bureau of Land Management). Each letter was coded to extract substantive content which was then entered into the (computerized) Content Analysis data base at the Custer National Forest.

Content Analysis Procedures

This is a joint Bureau of Land Management (BLM) and U.S. Forest Service (FS) project. An employee from each agency read and coded the letters, and checked each other's work. Comments were coded into categories that included: heritage resources, economics, fisheries, water issues, minerals and mining, recreation and tourism, wilderness, social issues, visuals, wildlife, planning, special management areas, the withdrawal proposal, and the New World Project.

Content analysis serves as a guide to help interdisciplinary team (IDT) members identify, analyze and respond to issues, concerns and questions. It is not a "voting" process; however, it does give an indication of the intensity of and breadth of interest in the issues among those who provided comments. Every comment receives equal weight in the process.

Demographics

In addition to the actual content of the comments, it is helpful to understand the origin of the comments. The "statistics" discussed in the remainder of this document represent only those who took time to comment in writing during the various public comment opportunities. Thus, it should not be assumed that the results reflect the attitudes or comments that might be expressed by a random sample of the general population. Excerpts from a few of the letters are included verbatim in each section that reflect a sample of the "feelings" and "values" expressed in the comments.

Commentor Classification

During the entire project, the CCAMW team received 391 responses, representing 467 individuals, businesses, groups, or other entities, as displayed in the table below.

Classification	# of Commentors
Individuals	381
Cities/Counties	5
Businesses	17
Elected Officials	1
Federal Agencies	4
Groups	22
Mineral Industry	20
State Agencies	3
Universities	1

TABLE 4.1 GEOGRAPHIC DISTRIBUTION OF COMMENTORS

Area of Origin	# of Commentors	Area of Origin	# of Commentors
Montana	264	Maryland	3
Wyoming	77	South Dakota	3
California	21	Virginia	3
Colorado	20	Washington, D.C.	2
Nevada	7	Florida	2
Texas	6	Massachusetts	2
Michigan	6	North Dakota	2
Minnesota	5	Ohio	2
Wisconsin	5	Oregon	2
Pennsylvania	5	Iowa	1
Utah	4	Kansas	1
Washington	4	Maine	1
Illinois	4	New Jersey	1
Missouri	4	New York	1
Nebraska	4	Virgin Islands	1
Arizona	3	Thailand	1

Analysis Process

Content analysis is a process of extracting substantive comments for consideration in the preparation of a subsequent analysis or document. The number of times a particular comment is entered into the data base has no bearing on how that comment is addressed. Therefore, to avoid needless duplication of identical comments in the data base, comments from each letter were entered only once, regardless of the number of signatures on the response.

Many of the individual comments extracted from the letters addressed more than one topic. When this occurred, the comment was entered into the data base under each of the appropriate topic areas. For this analysis, comments were distributed into 14 major categories, each of which had two or more subcategories.

For the summary of public response, the comments were then grouped into five major topic areas: Social and Economic Issues, Environmental Effects, Mining and Minerals, The Planning Process and the Proposed Mineral Withdrawal, and the New World Project. Presented below is the list of commentors and a brief summary of the comments received on the Draft EIS. The text of the extracted comments and questions, and the agencies' responses are presented in Appendix I, "Public Comment on the Draft EIS and Agencies' Responses," of this document. The appendix follows the structure of the Environmental Impact Statement (headings in the chapters and the appendices). Comments and questions regarding maps, references, and the environmental impact analysis process conclude the appendix.

Full text letters from State, County, and other Federal Agencies, and the responses to those letters are printed in this Chapter immediately following the "Summary of Public Comments." The letter from the U.S. Fish and Wildlife Service is printed in Appendix E, "Biological Assessment."

TABLE 4.2 LIST OF THOSE WHO COMMENTED ON THE DRAFT EIS

LETTER#	NAME	LETTER #	NAME
300	Steve Hicks	324	John M. Good
301	Richard Lambert	325	Dave Wheelock
302	Park County MT Commissoners - Copy of fax to Bruce Babbit	326	James O. Southworth
303	Jack & Jane Braten	327	Jeanne Harper
304	Carolyn St. James	328	Susan Pendleton Mavor
305	Kenneth Naylor	329	Richard D. Anderson, MD
306	Bob Thompson	330	Mr. & Mrs. Elmer Drange
307	Carol Reeser	331	Fred Crisp
308	Frank Baner	332	Hope Stevens
309	Frederick J. Maxted III	333	Thomas J. Weitz
310	Ursula A. Selyem	334	Andrea Murray
311	Lois B. Nichol	335	Sara Toobman
312	Steve Jacoby	336	Tim & ? Leifer
313	Jim & Virginia Court, Action Travel	337	Mary McMahon
314	Nancy M. Schlobohm	338	Marilyn Dinger
315	Dr. Kathy Hansen	339	Marian Setter
316	Steven Evans	340	Clark Alexis
317	Montana Mining Association Jill Andrews	340	Lynette Joy Johnson
318	Victoria MacDonald	341	Gonnie Siebel
319	Robert Staffanson	342	Melissa Blackford
320	John Fontana	343	State Historic Preservation Office Stan Wilmoth
321	Ward B. McCartney, III	344	Frederic & Beth Sammond
322	Jerry Schillinger	345	Mary Pelatt
323	Thomas K. Harding	346	Jeffery Hunnes

TABLE 4.2 LIST OF THOSE WHO COMMENTED ON THE DRAFT EIS (cont.)

LETTER #	NAME	LETTER #	NAME
347	Joyce Johannsen	371	Chuck Neal
348	Mel & Barbara Horton	372	Wyoming Trout Unlimited
349	Paula Scheuring	373	ssr engineers
350	Andrew Bryson	374	Geocon, Inc
351	Louisa Willcox	375	Donald McCracken Jr.
352	Hobie Hare	376	Silas Counts
353	James A. Swaney	377	Joe Gutkoski MT River Action Network
354	William H. Funk III	378	Sharon Harvey
355	Natural Resources Defense Council, Johanna H. Wald	379	Kevin L. Martinez
356	Doris Milner	380	Tim Stevens
357	John Langstaff	381	Richard C. Parks Bear Creek Council
358	Wade Sikorski, Ph.D.	382	Marissa Godoy
359	Bruce Muhlbradt	383	Metallurgical Services Gordon F. Ziesing
360	Phyllis Wolfe	384	Loren Smith
361	Jennifer Dolese	385	Park County Planning Dept
362	Farwell Smith	386	Lou A. Snodgrass
363	Ruth & Dave Grubler	387	Bernard G. Hurd Northwest Parts & Rigging
364	Dorothy & Clarence Stoltz	388	K. G. Thompson
365	Wayne & Pat Solberg	389	M. Ruth Nilswander
366	Alan Counts	390	The Leffingwell Guest & Cattle Ranch
367	Mary Brutgen	391	R. D. Clair
368	Mary Beth Marks, Ph.D	392	MT Bureau of Mines & Geology Robin McCulloch
369	Energy Laboratories, Inc.	393	Greater Yellowstone Flyfishers Chad Olson
370	Navratil, Unmack & Herring	394	Barbara Varnes

TABLE 4.2 LIST OF THOSE WHO COMMENTED ON THE DRAFT EIS (cont.)

LETTER#	NAME	LETTER #	NAME
395	Ester Carter	421	Marshall Dominick
396	Alan Counts	422	Lester & Marion Sunvison
397	Duplicate of letter 366	423	Hart Baiti
398	Pat Simmons	424	Steve Thomas
399	Joan Montagne	425	Wyoming Outdoor Council Caroline Byrd
400	Gordan & Helen Waller	426	Mary Dominick Chivers
401	Stephanie Cochrane & Ray Corbin	427	Valerie Hafner
402	Duplicate of 402	428	Dale Sexten
403	Cahill, Castle, Perreault, Christensen, & Kestner	429	Reid Collins
404	Emil & Rosetta	430	Void Number
405	Chan Libbey	431	Kathleen Crawfor, George Kahrl
406	Peter Aengst	432	Neel Miller
407	Steve Hicks	433	Ann Biastock
408	Sixty Three Ranch Sandra Cahill	434	Carlos Van Natter
409	Mary Fitzpatrick	435	Cliff Browne
410	Edith Woods	436	Duane Claypool
411	Thomas Dolese	437	Gary Boyer & Frank Meyers
412	Glen Gordan	438	Nellie Israel
413	Glen Hill	439	William Barmore Jr.
414	Andy Lindblad	440	7-D Ranch Spencer Dominick
415	Lisa Scharin	441	Wyoming Outdoor Council Caroline Byrd
416	Dick Ellis	442	Henry Dykema
417	Mr. & Mrs. Carman Consalo	443	James Denison
418	Jane Steffenhagen	444	Elizabeth Hartley
419	Fred & Katie Cady	445	Board of County Commissioners
420	Wesley Hamilton	446	K.R. Kiddoo

TABLE 4.2 LIST OF THOSE WHO COMMENTED ON THE DRAFT EIS (cont.)

LETTER#	NAME	LETTER #	NAME
447	Corps of Engineers	475	Leland Kevu
448	Ruth Petranek	476	Judy Adams McHale
449	Rose Karbowski	477	William F & Joan Humiston
450	Elizabeth Scanlin	478	Doug Parker
451	Jeanne Hum	479	Cynthia Benson Gee
452	Edward Skillman	480	High Country Motel, Inc.
453	Alan Jones	481	Sierra Club Legal Defense Fund
454	Carolyn Toyer	482	Greg Sauer
455	Heidi C. Barrett	483	Debbie Lineweaver
456	Don Bachman	484	Jason Wilson
457	Don Wirth	485	Mike Whittington
458	Roseanne C. Bloom	486	Cooke City Store
459	Pan-O-Rama West, Inc Virginia Johnson	487	Andrew W. Lammers
460	Betty Rae Luckinbill	488	Minerals Exploration Coalition
461	Ral W. Hall	489	Allan R. Kirk
462	Dick Kragler	490	Cecelia Youngblood
463	Frederick & Clella House	491	YNP
464	Art & Shirley Bales	492	Philip J. Campbell
465	B. Gialdini	493	R. MacAlpine
466	David Gialdini	494	Montana Mining Assn
467	Gene & Beth Bowling	495	Ted Antonioli
468	Dave Courtis	496	George Ommundsen
469	Randy Powelson	497	Margaret Reeb
470	Joseph C. Icenogle	498	Rob Corkran
471	John & Joyce Sholz	499	Bruce E. Cox
472	Park County Multiple Use Assn.	500	Greater Yellowstone Coalition
473	U.S.G.S.	501	Montana Wilderness Association
474	WY Gov. Jim Geringer	502	Montana Chapter Sierra Club

TABLE 4.2 LIST OF THOSE WHO COMMENTED ON THE DRAFT EIS (cont.)

LETTER #	NAME	LETTER #	NAME
503	Laura Redish	507	Randy Powelson
504	Nolan Smith	508	Bryan Wyberg
505	Crown Butte Mines, Inc.	509	John R. Swanson
506	Northwest Mining Association	510	Charles M. Hauptman

SUMMARY OF PUBLIC COMMENTS

Social and Economic Issues

Social

Commentors who wrote about the "quality of life" of those who live and recreate in the Cooke City/Silver Gate area expressed concerns about potential impacts on the social structure of the communities and the area. Many also wrote about their concerns for the area resources that combined to make this a "special place."

> *"...the withdrawal will help to preserve the social structure, character, and quality of life now stable in our small communities. Large-scale mining would bring destructive rapid growth beyond that which we can tolerate and still maintain our cultural integrity."*

> *"There is no question that quality of life would deteriorate with increased traffic, housing sprawl, boom and bust entry and exit from communities, demands on current infrastructure and government services."*

> *"It is a source of enjoyment for those seeking peace and quiet and a chance to "get away" from noise and crowds. A place to marvel at the beauty of nature—which is much more precious than gold, by far!"*

Some commentors also expressed concern about the potential of government "takings" as a result of diminishing their ability to develop their private land or patented mining claims for mineral production. Some commentors also expressed concern about the role of "politics" in the withdrawal proposal.

> *"Your decision will violate Constitutionally protected property rights. Such decisions should not be made for political reasons."*

> *"If the withdrawal occurs, what does the withdrawal do to the value of the inholdings, how are the owners compensated for any decrease in such value, and which agency of the federal government is responsible for payment for such 'takings'? If this withdrawal is approved the private claims outside of the Crown Butte holdings will be rendered useless because of the inability to use the joining land."*

> *"A withdrawal would set a dangerous precedent for taking public and private lands away."*

Others expressed concern about the effects of mining in the area and presented their perceptions of how these federal lands "should" be managed to benefit the public.

> *"In addition, mining would result in a sudden and drastic alteration of the social fabric and character of the Cook City/Silver Gate communities; that which attracted most of the year-around and seasonal residents originally."*

> *"Equally important, the withdrawal will help to preserve the social structure, character, and quality of life now stable in our small communities. Large-scale mining would bring destructive rapid growth beyond that which we can tolerate and still maintain our cultural integrity."*

> *"Mineral development, and all that it entails, in this area contradicts the very reasons that most of us live in and others visit the area."*

> *"Our public lands should be protected for all of our enjoyment, and the habitat that we save will be able to*

> *be shared forever, with our friends, tourists, children, and the wildlife."*

> *"These lands are owned by all the people of the United States and to risk the potential problems associated with mining in the proposed area is not worth the insignificant revenue which the project would generate for the owners (the people)."*

Scenic Value

While "scenic integrity" is evaluated as a part of recreation resources, many commentors expressed concerns for scenic values in a social context.

> *"...with a knowledgeable eye the study area is plainly visible from the summit of the Beartooth Pass, the Scenic View of Sunlight Basin and Pilot Overlook and by the aspen grouping above the intersection. This would be visible to the uneducated eye very dramatically if it were lighted, which could happen. As far as I am concerned mining in this area would be devastating to the pristine, untouched, overwhelming view that now exists."*

> *"Maintaining the high quality of the scenery in the area is critical. While the scenic quality in portions of the analysis area has already been degraded by previous mining operations, we hope that the long term cleanup effort will at least improve some of the currently visible scars."*

Conversely, others commented:

> *"Montana's laws provide for cleanup of old problems through permitting of new operations, with no cost to the public. The area would have higher visual values after a permitted mining operation than what presently exists."*

Special Management Areas

Many commentors who wrote in favor of the withdrawal proposal expressed their attachment to Yellowstone, the nation's first national park, and their concerns about protection of the entire surrounding ecosystem. The perception among many of those who commented is that Yellowstone National Park appeals to a nationwide, as well as an international audience, and that protection of the study area is integral to protection of the Park.

> *"One of the world's greatest natural treasures is imperiled by this mining. Nothing you can do legally is enough..."*

> *"I believe that it should be emphasized that this is a location in the midst of spectacular designated wilderness areas and very near to one of the world's natural jewels, Yellowstone National Park."*

> *"Mining in this area is a threat to Yellowstone National Park and should not take place so near the park's boundaries."*

> *"The proposed action will best protect the water and air quality, wildlife and the natural wonders of Yellowstone National Park from degradation."*

> *"This area is an important buffer zone for Yellowstone National Park and the Wilderness areas which surround us."*

Others, who opposed the withdrawal proposal, commented that mining in the study area would have little effect on the Yellowstone National Park.

> *"No commercial traffic going to the mine is allowed to cross the Park. There are two mountain ridges between the mine development and the Park. None of the mineral development could be seen from the Park. Mining would have little effect upon Yellowstone Park."*

Recreation and Tourism

Some commentors addressed the effects of tourism in terms of benefits to the local economy provided by tourists who come to enjoy the splendor of the scenery. Others asked the interdisciplinary team to consider that tourism also may have a "downside" in that those who visit and recreate in the area may create negative impacts on the land.

> *"The present tourist economy would be severely affected and mining has always been short-term, which usually ends up being economically disastrous."*

> *"The area has also been, and is, extensively used by various multiple use groups which affect the ecosystem. Such uses include trailbikers, hunters, horsemen, campers, cross-country skiers, snow-mobilers. A more detailed analysis of the impact of these types of use must be made for comparison of that of mining on the fish, fowl and wildlife of the area."*

> *"Page 137 - States that recreation and tourism is a nonconsumptive use. I would disagree the recreation is a nonconsumptive use. Tourists are among the most consumptive users of resources. The notion that tourism and recreation are nonconsumptive uses of land is one that needs to be rethought. The impacts are wide ranging and sometimes irreversible."*

Economics

Comments on economics ranged from those which expressed the need for the good paying jobs that come with and support mining activities, to those which expressed concern that mining-related activities would keep tourists and other recreationists away, thus affecting the livelihoods of those who now own or are employed in tourist-dependent businesses in the area.

> *"So many young people need a job that pays enough for them to raise a family, they cannot do this working at Hardee's or Burger King. Please help to stop all this foolishness and let some of our people stay in MT."*

> *"The true and untouched areas are nice, but they sure don't put food on the table and they are not supporting our business through the winter, where for four months in small towns you can close your doors and be better off."*

> *"...we can attest to the economic necessity of preserving the scenic, aesthetic, wildlife, and recreation values that form the lifeblood of our sustainable tourism industry. The mineral withdrawal would provide a very positive impact to our local tourism and recreation economy."*

Other commentors expressed concern for the loss of revenue to surrounding cities and counties if the mining industry leaves the region.

> *"Without the mine, Montana stands to lose many millions of dollars in revenue. With the oil industry paying less in revenue each year in Park county Wyoming, we need more, not fewer, businesses."*

> *"Curtailing mining production also has significant impacts on local school districts and county tax bases. For example, Park County will lose over 1.2 million dollars in five years of projected revenue from the actions taken to prevent Crown Butte's operation. There are similar impacts in Sweet Grass County."*

Some commentors expressed their concerns about the need to provide minerals to the marketplace to meet the needs of technology and the demands of society.

> *"Recovery of minerals is such an essential part of America's economy and National well-being."*

> *"We need many metals in our life style today."*

Several others addressed the potential effects the withdrawal could have on future investments in mining exploration and development in the United States.

> *"...the ripple effect from the situation surrounding this particular withdrawal is having a chilling effect on domestic investment for new mineral production."*

Tied into economics and the pros and cons of mineral exploration came comments on the historical uses in the New World Mining District.

> *"I also oppose the closing of public land from mineral exploration and mining activity in an area that is known to contain mineral deposits and which encompasses four historic mining districts for national security reasons."*

> *"The entire area has historically been in the mining district with extensive mining."*

> *"The Cooke City area is an historical mining area and has numerous known mineral deposits which can be obtained in a responsible mining effort."*

Environmental Effects

Water

The majority of the comments in this category dealt with water quality and what might happen to rivers and creeks in the area as a result of mining. Some expressed concern that mining would destroy water quality; others wrote that mining, and the reclamation efforts that are integral to mining operations, might improve water quality through clean up of existing sources of pollution to area streams. Some commentors pointed out the sufficiency of laws and regulations and agency responsibilities that already exist to take care of water quality.

> *"Your study assumes mining will destroy the water quality, the fishery, the wetlands, the wildlife, the recreation and the whole area, when it is just as possible that with todays [sic] known technology and regulations, mining will produce better quality water than exists today."*

> *"The effects of future hardrock mining, that could occur on federal lands if mineral withdrawal is not accomplished, include increased acid-rock drainage, the potential for ground-water contamination, the potential hazards from failure of tailings impoundments."*

Several letters noted that some mineralization in the stream water is naturally occurring and that mineralization of these streams has been going on for thousands of years..

> *"The fact is the area contains ferrocrete zones that started to form with the retreat of the glaciers. Many streams have low pH levels and cemented, lifeless streambeds from natural erosion of mineral deposits enhanced from early mining operations. Many of those 'pristine' waters and soils contain elevated metal levels because of the deposits in their origins."*

Wildlife

A number of letters expressed concern for maintaining habitat for bison, grizzly bears, wolves, and other wildlife species. One person reported noticing a decrease in the moose population and asked if a loss in habitat in the withdrawal area might not hasten that decline.

> *"...Bald eagles, Peregrine falcons, Grey wolves, Wolverine and Lynx. Mining activity could have a significant negative impacts on these recovering species."*

> *"I speak for the animals when I say they do not want their home turned into a mining site. We can't keep pushing them into a smaller and smaller area."*

In contrast, one person wrote:

> *"As demonstrated at other Montana mines, each mine site, because of permit restrictions and safety is closed to hunting and public incursion. The sites become wildlife preserves causing for less impact on the wildlife than the public recreation areas."*

Wilderness

Issues raised about potential effects of mining on the Wilderness areas was divided. Some commentors noted the project's proximity to the Absaroka-Beartooth and North Absaroka Wilderness, and addressed the need for the withdrawal to protect those areas. Others noted that Congress had deliberately left the New World Mining District out of wilderness designation because of its mineral potential.

> *"The Absaroka-Beartooth Wilderness is the most heavily used wilderness area in the Northern Region, with 514,000 Recreation Visitor Days of use in 1995. Outside designated wilderness, the non-designated roadless lands are critical to the ecological functioning of the wilderness areas. The public has identified protection of the pristine wilderness character of this area as its highest and best use.*

> *"Mining and wilderness are incompatible."*

> *"The proposal is contrary to the intent of Congress when it passed the Absaroka Beartooth Wilderness Act in 1978 in that the New World Mining District was specifically excluded from the Act because of the minerals potential."*

> *"Mining activity 'could be visible from wilderness areas near Yellowstone NP'? We need buffer zones for our wilderness areas. Keep our wilderness, wilderness, please."*

Mining and Minerals

This category received the largest number of comments. Those who opposed the withdrawal or expressed support for mining in the area commented on the high mineral potential of the mining district. Some expressed concern that the government, by law, is supposed to encourage, rather than discourage, mineral development. Many of these commentors mentioned that existing laws and regulations are sufficient to regulate mineral exploration and development, as well as provide for mitigation of impacts to other resources and reclamation activities.

> *"Current environmental laws are fully capable of operating and arriving at a fair and impartial decision as to whether any proposed mining operations can be done in a responsible and environmentally sound manner."*

> *"Any mining operation would have to conform to the regulations of the many agencies looking out for America's environment."*

> *"The significant mineral potential of the proposed withdrawal area has been known for many years, and the area has produced minerals with no significant adverse affect to other multiple users or to the integrity of Yellowstone National Park."*

> *"Mining activities can be conducted, today, in a manner which eliminates many of the problems of the past and reclaims the land. We have many examples of projects conducted by our members which have actually improved wildlife habitat and restored the land. "*

Commentors who supported the mineral withdrawal or opposed mining in the area expressed concerns about the potential effects of mining and mining-related activities on the environment, including the long-term effects on surface and ground water quality, the potential effects to wildlife, and the ineffectiveness of reclamation efforts at these altitudes. The revision of the General Mining Law of 1872 was also addressed by some of the commentors in this category.

> *"The environment must be protected from mining and pollution."*

> *"Please remember that mining can destroy in years what nature took eons to build, and like Humpty Dumpty it can never be put back together again."*

> *"It is about time that we reform the 1872 Mining Law, so you can just get back to doing your job, and not having to do battle with the multinational mining corporations, who have unlimited power and money."*

The Planning Process and the Proposed Mineral Withdrawal

Planning

The "Planning" category of the content analysis focused on comments about forest plans, land uses, compliance with the National Environmental Policy Act (NEPA), and alternatives addressed in the withdrawal process..

> *"...the DEIS...lacks a full range of reasonable alternatives. The Withdrawal Team failed to consider other reasonable partial withdrawal alternatives. A real issue identified during scoping was, would a partial withdrawal satisfy the desire to greatly enhance protection afforded Yellowstone National Park."*

> *"The criteria outlined in the Forest Plans deserve careful consideration in the final EIS; particularly where the Department proposes to withdraw lands that were considered in the planning process and assigned to a management area that provides for the exploration and development of mineral resources."*

Mineral Withdrawal

Some comments about the Draft Environmental Impact Statement (EIS) discussed the process of withdrawing federal land from mineral activity. The presidential moratorium on new mining claims in the area that initiated the withdrawal proposal and the perception of "political interference," in the New World Project generated comments, as did the perceived precedent-setting nature of a withdrawal in such a highly mineralized and historically-mined area. Some commentors expressed doubt that the mineral withdrawal EIS could be unbiased; it was being prepared to "justify" a "political" decision that had already been made by the Administration.

> *"The harm it could actualize is that it would set a precedent for withdrawing other highly mineralized areas containing minerals desperately needed by our nation."*

> *"This action sets a dangerous precedent whereby areas available for mining and minerals exploration and production are determined bureaucratically rather than on the economic, environmental, and sociological criteria that are established and working elsewhere."*

> *"...it is a very unusual DEIS, inverting the usual process, and creating an after-the-fact justification for political interference in what was an on going, and nearly complete, process of environmental review for the New World project. It sets x precedent for a system of "presidential review" of mine projects, since many or most large scale projects require various federal permits."*

> *"...the document has little discussion of the policy behind the decision or the policy implications of a withdrawal. In fact the politics behind the proposed withdrawal is a key element of the proposal and is not discussed at all."*

New World Project

During the scoping period for the proposed mineral withdrawal, the Administration, Crown Butte Mines, Inc., and the Greater Yellowstone Coalition, announced they had formulated an "Agreement" through which the United States would acquire Crown Butte's interests in the New World Mining District. This action halted development of the controversial New World Project and completion of an environmental impact statement for the mine proposal being prepared by a third-party contractor (funded by Crown Butte Mines, Inc.) for the State of Montana and the Forest Service.

Although the areas are linked by geography, the environmental impact analysis for the New World Project and the environmental impact analysis for the proposed mineral withdrawal have been conducted as separate processes. Many of those who submitted comments on the Draft EIS for the proposed mineral withdrawal, however, did not separate the New World Project (or their thoughts about the mine) and the events surrounding the New World Mine Agreement from the withdrawal.

> *"Though this action is independent of the New World Mine Agreement, a decision to withdraw these lands would preclude options for location of the mine tailings pond should the Agreement not be implemented."*

"I urge the withdrawal as a stand-alone proposition regardless of other swap agreements that may evolve."

"I am concerned that the BLM/Forest Service proposal to withdraw 22,000 acres in and around Cooke City from mineral exploration and mining activity may be linked to the deal made between Battle Mountain Gold and the Clinton Administration over the New World Mine and UN's World Heritage Committee recommendation that a 100-mile buffer zone be placed around Yellowstone Park."

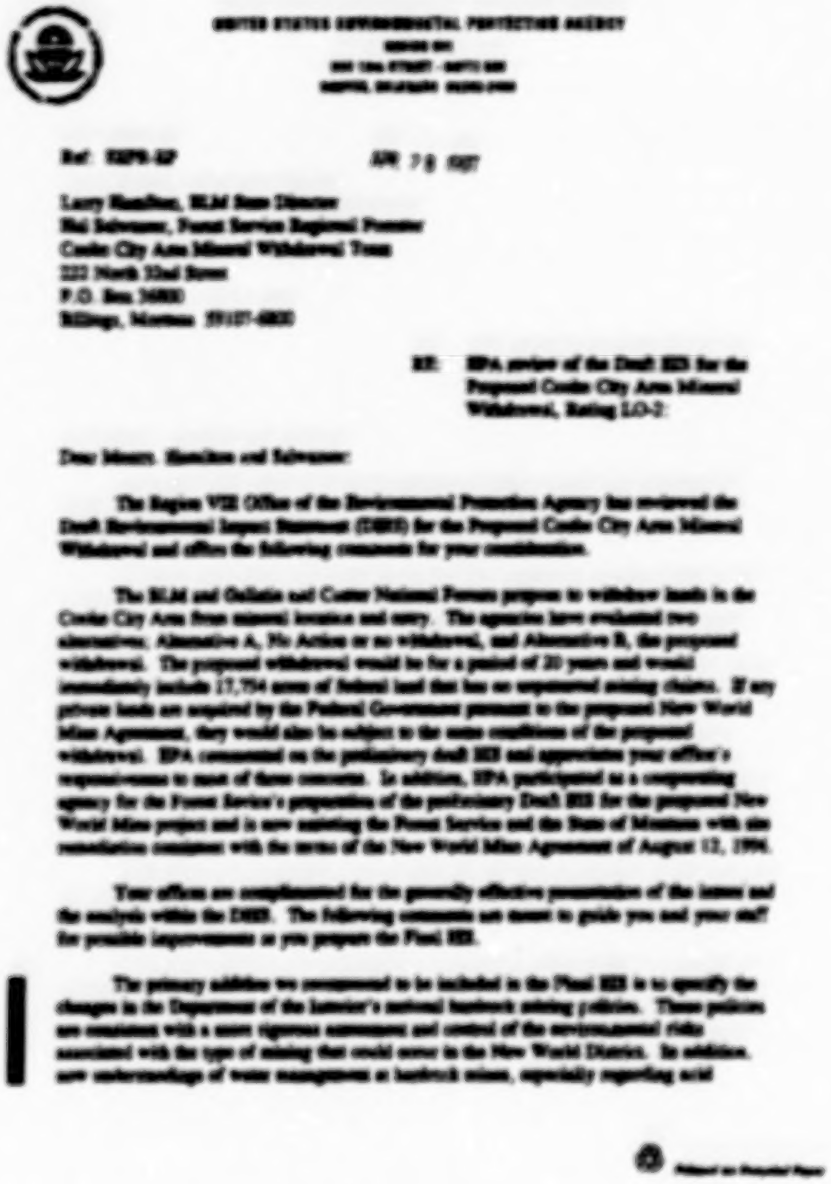
"...while the New World Mine Agreement and Cooke City Area Mineral Withdrawal are separate entities, they both would afford a great amount of protection from mining impacts to this very special area."

"Please look toward future generations by removing this valuable watershed area of public land in conjunction with the BLM New World Mine agreement."

Preferences Expressed in the Comment Letters

Of those who commented on the proposed withdrawal, 214 stated support for the proposed withdrawal, 28 stated strong support for the proposal, 75 stated opposition to the withdrawal, 28 stated strong opposition to the proposal, and 46 did not express support or opposition or only submitted technical suggestions.

FEDERAL, STATE AND COUNTY GOVERNMENT LETTERS AND RESPONSES



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

Ref: 8EPR-EP APR 28 1997

Larry Hamilton, BLM State Director
Hal Salwasser, Forest Service Regional Forester
Cooke City Area Mineral Withdrawal Team
222 North 32nd Street
P.O. Box 36800
Billings, Montana 59107-6800

RE: EPA review of the Draft EIS for the Proposed Cooke City Area Mineral Withdrawal, Rating LO-2

Dear Messrs. Hamilton and Salwasser:

The Region VIII Office of the Environmental Protection Agency has reviewed the Draft Environmental Impact Statement (DEIS) for the Proposed Cooke City Area Mineral Withdrawal and offers the following comments for your consideration.

The BLM and Gallatin and Custer National Forests propose to withdraw lands in the Cooke City Area from mineral location and entry. The agencies have evaluated two alternatives, Alternative A, No Action or no withdrawal, and Alternative B, the proposed withdrawal. The proposed withdrawal would be for a period of 20 years and would immediately include 17,754 acres of federal land that has no unpatented mining claims. If any private lands are acquired by the Federal Government pursuant to the proposed New World Mine Agreement, they would also be subject to the same conditions of the proposed withdrawal. EPA commented on the preliminary draft EIS and appreciates your office's responsiveness to most of those concerns. In addition, EPA participated as a cooperating agency for the Forest Service's preparation of the preliminary Draft EIS for the proposed New World Mine project and is now assisting the Forest Service and the State of Montana with site remediation consistent with the terms of the New World Mine Agreement of August 12, 1996.

Your offices are complimented for the generally effective presentation of the issues and the analysis within the DEIS. The following comments are meant to guide you and your staff for possible improvements as you prepare the Final EIS.

1 The primary addition we recommend to be included in the Final EIS is to specify the changes in the Department of the Interior's national hardrock mining policies. These policies are consistent with a more rigorous assessment and control of the environmental risks associated with the type of mining that could occur in the New World District. In addition, new understandings of water management at hardrock mines, especially regarding acid

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1 Appendix B. Mineral Forecast, Legislative Changes section provides background on possible revisions to the mining laws and regulations. The analysis attempts to stay focused on the mineral withdrawal of the Cooke City Area; larger and, in some cases, unresolved policy issues may tend to shift focus to these larger issues rather than the immediate issue of the Cooke City area withdrawal.

1 drainage, and the need to protect the taxpayer from the expense of reclamation and remediation following hardrock mine financial failures, have resulted in significant changes in the nation's approach to hardrock mining which are consistent with the purpose of the proposed Cooke City Area mineral withdrawal.

Significant preceding policy events include: 1) the Secretary of the Interior's proposed revisions to the hardrock regulations under 43 CFR 3809, 2) the bankruptcy and subsequent CERCLA action at the Summitville Mine in Colorado owned by Galactic Resources, Inc, and 3) the significant Clean Water Act violations at the Zortman-Landusky Mine in northcentral Montana owned by Zortman Mining Inc. and Pegasus Mining Inc. Including these preceding events into the Final EIS, might provide the reader and the decision maker current information regarding the consistency of the proposed action with the emerging policy trends in the hardrock mining policy of the United States.

2 Since the purpose of this project is to protect water quality and fishery resources in the watersheds of Soda Butte Creek, Clarks Fork Yellowstone River, and Stillwater River, it would appear appropriate to more thoroughly discuss whether there is any potential for these watershed resources to be impacted by future mining on the lands that are exempt from this proposed mineral withdrawal; that is, without implementing the New World Mine Agreement.

3 Further, it may be that the purpose could be considered too narrow *if* limited to protection of water quality and fishery resources within the District. The purpose could be expanded to be made compatible with the New World Mine Agreement which established that the purposes for that agreement include protection of Yellowstone National Park and surrounding areas, protection of significant national resources including the Absaroka Beartooth Wilderness and the Clarks Fork of the Yellowstone River, and the elimination of the threat of mining in the area. Inclusion of the same criteria in the purpose statement of the Final EIS would further clarify that the proposed action of mineral withdrawal and implementing the NWM Agreement are consistent in providing further protection for the unique natural values within the New World Mining District.

Pursuant to procedures EPA has established to rate the proposed action and adequacy of the Draft EISs, the Draft EIS for the Proposed Cooke City Area Mineral Withdrawal will be listed in the Federal Register in category LO-2. This means EPA lacks objection to the proposed action and suggests that additional information be included in the Final EIS as suggested above. Please call Weston Wilson of my staff at (303) 312-6562 if we need to further clarify these comments.

Sincerely,

Carol L. Campbell

Carol L. Campbell, Director
Ecosystems Protection Program

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1 The EIS identifies mining-related risk including failed mitigation and departure from standards. Chapter 3, Environmental Effects of Scenario A-1 to water quality, includes a section on noncompliance violations that have occurred in Montana including Zortman-Landusky. Appendix H, Failure Modes Effects Analysis, has been added to serve as an example of mining-related risk from New World Mine alternatives to water and aquatic resources. Discussion of other mine failures would require in-depth discussion of the probable causes, environmental setting, history of the operation and existing regulatory climate. That is beyond the scope of this analysis. Furthermore, other commenters pointed out examples of successful mines.

2 Scenario A-1, No Mineral Withdrawal, No New World Mine Agreement, and Scenario B-1, Mineral Withdrawal, No New World Mine Agreement, include the potential effects of future mining on private land and existing unpatented mining claims. Based on public comment and further analysis, the Water Quality and Quantity, and Aquatic sections of Chapter 3 have been updated. Appendix H, Failure Modes Effects Analysis, identifies potential consequences to these drainages from mine-related failures.

3 Based on public scoping, a number of additional reasons for the withdraw were added, including protection of surrounding wilderness areas, scenic integrity, recreation opportunities, cultural resources and wildlife. The original purpose and need included protection of watersheds and freshwater fisheries in Yellowstone National Park. The Mineral Withdrawal and NWM Agreement are two separate and distinct decisions. As the withdrawal could be implemented in the event the NWM Agreement failers, linking the purpose and need of two separate actions would not be appropriate.

United States Department of the Interior

NATIONAL PARK SERVICE
P.O. Box 168
Yellowstone National Park
Wyoming 82190

L3023 (YELL)
[illegible]

[illegible]

Cooke City Area Mineral Withdrawal Team
222 North 32nd Street
Billings, Montana 59107-6800

Dear Mr. Thompson and Mr. Timchak:

The National Park Service (NPS) commends the Bureau of Land Management, Montana State Office, and the U.S. Forest Service, Northern Region, on completion of the draft environmental impact statement (DEIS) for the proposed Cooke City area mineral withdrawal. Review of the DEIS reveals a well thought out and researched procedure for analyzing impacts resulting from not only the proposed mineral withdrawal but also implementation of the 1996 New World Mine agreement. In addition to being a technically sound document, the text, tables, and illustrations proved to be informative and "reader friendly." Most important, the analysis appropriately acknowledges the short- and long-term risks and uncertainties inherent with mining and further acknowledges that there is much disagreement as to the level of potential adverse environmental impact.

We fully support the concept of the proposed Cooke City area mineral withdrawal and the New World Mine agreement as presented in alternative B-2 of the DEIS. For a number of years, we have expressed many concerns about potential impacts from mining in the Cooke City area on the resources and visitors of Yellowstone National Park. We believe alternative B-2 best addresses these concerns.

Attached for your consideration are a small number of specific comments on the DEIS offered in the spirit of assisting the lead agencies to further strengthen the environmental analysis. We appreciate the numerous opportunities offered us to work with you at the preliminary draft stage of the EIS. If you have any questions about our comments, please contact Mary Hektner, Resource Management Specialist, at (307) 344-2151.

Sincerely,

G. C. Menard
Michael V. Finley
Superintendent

Enclosure

cc:
Bob Rossman, Shoshone National Forest
Tom Reid, Montana Water Quality Bureau, Helena
Bill DiRienzo, Wyoming Dept of Environmental Quality
Bob Nebel, Corps of Engineers, Omaha
Don Ogaard, Bureau of Land Management
Wes Wilson, US Environmental Protection Agency

Detailed comments by NPS, Cooke City Area Mineral Withdrawal DEIS

1	**Reader's Guide Insert** - Alternative B is mislabeled on the reader's guide. Alternative B should be labeled "mineral withdrawal" instead of "no mineral withdrawal."	The map legends have been corrected for the Final EIS.
2	**Page iv** - All maps contained in this EIS would benefit by the placement of a scale in the legend.	A scale has been added to maps in the Final EIS.
3	**Page v** - This page lists Ag, As, Cu, Mo, and Pb as "acronyms." The DEIS could more correctly list these items as chemical symbols using the Latin name of the mineral. Also, Pb is incorrectly labeled as Palladium when it should be lead (Plumbum).	These changes were made to the Final EIS.
4	**Page 15, Management Common to all Alternatives** - This paragraph states that "[unpatented claims . . .] would also require annual improvements or filing of holding fees." The lead agencies should revise the sentence to read that claimants are required to pay a "claim maintenance fee."	This change has been made in the Final EIS.
5	**Page 26, Table 2-3** - The comparative summary of impacts in this table only list mining as a possible land use in the Cooke City mineral withdrawal area. The table would benefit from a short summary of other land uses that could take place in the area such as timber production or possible summer residential use (on private lands).	Timber production and summer residential use of private land was not discussed in the Comparative Summary of Impacts table (Table 2-3) because it was not considered to be a major impact of either alternative. These are discussed in the "Land Use" section under "Current Land Uses in the Study Area". These are also addressed in the expanded analysis and discussion of cumulative effects for the various resources.
6	**Page 27, Table 2-3** - The portion of this table addressing economics states "[c]ounty and local governments may experience budget shortfalls." The statement could be improved by adding "...but may be balanced by increases in the tax base over the long run."	The Table 2-3 has been edited to emphasize this point. The text of the Final EIS has been modified to indicate that in Montana county and local governments budget shortfalls caused by large-scale hard-rock mines could be mitigated by terms of Montana's Hard-Rock Mining Impact Act. In Wyoming, budget shortfalls could remain until after mining ceases unless a voluntary Impact Plan could be negotiated to mitigate budget impacts.
7	**Page 33, Water Quantity, Environmental Effects** - We request that the description of effects include a discussion on the potential for changes in the quantity and timing of surface flow due to impoundments associated with mining. For example, in one of the mining alternatives of the New World Mine PDEIS, there is an impoundment proposed in the upper Soda Butte Creek drainage for disposal of tailings and capturing run-off for process water. The State of Montana/National Park Service Reserved Water Rights Compact requires that there be no change in the timing, quantity or quality of flow in Soda Butte Creek at the park boundary. Because there are large peak flows on Soda Butte Creek due to snow melt, replacing water intercepted by the impoundment would require a very large augmentation flow rate over a period of days. This would require a much different engineering solution, potentially requiring much more extensive facilities than would be needed to merely replace water intercepted from ground water aquifers (which would require a lower augmentation flow rate over the entire year).	The Environmental Effects section for surface water quality, Alternative A, Scenario A-1 was amended to include a description of how some of the NWP alternatives include a tailings impoundment partially within the Soda Butte drainage which would discharge to Fisher Creek/Clarks Fork. Water captured by impoundments in the Soda Butte Creek drainage and conveyed out of the drainage is subject to augmentation requirements of the NPS/DNRC water rights compact. This would require a mining company to acquire water rights for a consumptively used water use and convey replacement water to the Soda Butte Creek drainage.
8	**Page 47, Conclusion** - The first sentence incorrectly states: "Neither alternative would have direct impacts to streamflow, water quality, legal availability of water, wetlands, floodplains, or air quality." The DEIS discusses numerous potential direct impacts throughout the document, and the statement about air quality in the surface and ground water, wetlands, and floodplain section is out of place. The sentence should be revised to state: "Both alternatives could result in direct impacts to streamflow, water quality, legal availability of water, wetlands and floodplains."	This statement alludes to the programmatic nature of a withdrawal decision which does not result in any direct environmental effects. However, the statement may appear confusing so it has been dropped from this paragraph.
9	**Page 52, Sediment** - The discussion on sediment loads should include associated metal contaminants. For example, higher concentrations of toxic materials mixed in with sediments below McLaren tailings would have more of an impact on invertebrates than the "excessively high" (and non-toxic) sediments contributed by downstream sources such as Woody Creek. Thus, in a mining area, the type and source of the sediment may have a more immediate effect on aquatic organisms than the quantity introduced throughout the basin. The tailings could also be displaced into the park again during extremely high water years (as occurred in the 1950s) and continue to long-term, although not highly visible impacts to the stream.	The following information has been added to "Aquatics" section, "Affected Environment of Soda Butte Creek", "Sediments": "Furthermore, metals-laden oxidized sediments readily erode from the historical McLaren tailings and are deposited downstream within Soda Butte Creek and along its floodplain. These sediments have been shown to have high concentrations of copper, zinc, iron, lead, and arsenic (Meyer, 1993) and are likely causing toxic injury to fish and other aquatic life in Soda Butte Creek." Under "Cumulative Effects Common to all Scenarios" in the "Aquatics" section additional text on the effects to Soda Butte Creek was added.
10	**Page 160, Grizzly Bear (Threatened)** - We agree that it is difficult to determine actual population numbers of grizzlies. However, we encourage you to cite the most accurate current estimate which can be found in	A statement was added to the Final EIS to reflect this information provided by YNP. "One recent estimate of grizzly bear population trends is contained in Eberhardt and Knight, 1996."

Eberhardt, L.L. and R.R. Knight. 1996. How many grizzlies in Yellowstone? Journal of Wildlife Management 60(2) pages 416-421.

11 Page 178, Bears (3rd line) - [illegible]

12 Appendix B, Page B-3, Commodity Prices - We recommend the lead agencies change commodity pricing in the first column to reflect a gold price of $380/oz. to more closely reflect current economic conditions and the silver price change to $5.50/oz. for the same reason.

13 Appendix E, Page E-3 - We suggest that the references cited on this page be also included in the overall REFERENCES section beginning on R-1.

11 The text in the Wildlife section discussing this subject has been corrected for the Final EIS.

12 The commodity listing pricing in the Final EIS (Appendix B, page B-3) has been changed to reflect the last ten year average prices - $380 per ounce for gold and $5.50 per ounce for silver.

13 All but one reference was previously included. The additional reference has been added as follows: "Knight, R. R., B. M. Blanchard, and L. L. Eberhardt. 1988. Mortality patterns and population sinks for Yellowstone Grizzly Bears, 1973-1985. Wildl. Soc. Bull. 16:121-125."

APR 2 5 1997

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Reston, Virginia 22092

In Reply Refer To:
Mail Stop 423

MEMORANDUM

APR 2 3 1997

To: State Director, Bureau of Land Management

From: James F. Devine
Senior Advisor for Science Applications

Subject: Review of Draft Environmental Impact Statement for the Proposed Cooke City Area Mineral Withdrawal

As requested the U.S. Geological Survey (USGS) has reviewed the subject draft environmental impact statement and offers the following comments.

1 **Table 2-3, for Alternative A; Scenario A-2, Surface and Ground Water, Wetlands, and Floodplains:**

Regarding the statement, "Impacts may occur in either Stillwater or Soda Butte Creek drainage if a mine is developed," the 'most likely area of mineral activity' shown on Map 2-2 seems to include areas within the Clarks Fork drainage also. Perhaps the Clarks Fork drainage should be added to the sentence above.

2 **Table 2-3, for Alternative B; Scenario B-1, Surface and Ground Water, Wetlands, and Floodplains:**

We question the statement, "Streams, wetlands, and floodplains on 17,760 acres withdrawn would not be at risk from mining." Some hydrologic effects could occur on the 17,760 acres withdrawn if subsurface effects extended beyond the area open to mining, if surface-water quality at the boundary of the area open to mining was degraded or did not meet applicable water-quality standards, or if surface-water quantity at the boundary was either increased or decreased from current conditions.

3 **Page 43, Alternative B-1:**

The text description (right hand column, bottom of page) appears to be in error.

Copy to: USGS State Representative, Water Resources Division, Montana
Director, Office of Environmental Policy and Compliance

1 The Clarks Fork River drainage was added to this sentence.

2 Table 2-3, Comparative Summary of Impacts has been edited as follows: "While mining would not occur on 17,760 acres of federal land, waterbodies & wetlands could still be affected by mining activity on adjacent lands available for mining."

3 The first paragraph in the referenced section was included in error and has been deleted.

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APR 1997 447

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
215 NORTH 17TH STREET
OMAHA, NEBRASKA 68102-4978

April 15, 1997

REPLY TO
ATTENTION OF
Planning Division

Mr. Larry Timchak
US Forest Service
Cooke City Area Mineral Withdrawal Team
222 North 32nd Street
PO Box 36800
Billings, Montana 59107-6800

Dear Mr. Timchak:

Thank you for the opportunity to review the Draft Environmental Impact Statement (DEIS) for the proposed Cooke City Area Mineral Withdrawal. Our comments are as follows.

1 The Summary at pages 14-15 does not adequately summarize potential impacts to waters of the US, including wetlands. The magnitude of the potential impact to both wetlands and non-wetland waters is not presented as discussed at page 45, seventh paragraph in the DEIS. Indirect impacts caused by streamflow reductions and degraded groundwater quality must be discussed. The third sentence on page 15 should be changed to explain that wetland impact analysis requires the delineation and mapping of all potentially affected wetlands and non-wetland waters of the US, a determination of their functions, a rigorous exploration of alternatives that avoid and minimize impacts, and an investigation of ways to mitigate unavoidable impacts. It should also be noted that some wetland losses, such as fens, cannot be recreated.

2 Chapter 3, page 46, first sentence - It is stated that 180 acres of potential wetland mitigation sites (on and off site) have the potential to compensate wetland acreage and function losses that would be caused by the New World Mine. We cannot concur in this potential without further evaluation and investigation.

3 Chapter ' ,age 47, Conclusion - The first word in this section should be "either" instead of "neither."

Should you have any questions regarding our comments, please contact Mr. Bob Nebel of my staff at 402-221-4621.

Sincerely,

Candace M. Thomas
Chief, Environmental Analysis Branch
Planning Division

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1 Your suggestions on wetland effects have been incorporated into the Summary and Table 2-3, Comparative Summary of Impacts.

2 The 180 acres of potential wetland mitigation sites are proposed by Crown Butte and mentioned in the PDEIS for the NWP. The Wetland and Floodplains, Environmental Effects, Alternative A, Scenario A-1 acknowledges that at the time of the cessation of work for the NWP EIS (8/96) more mitigation plan development was needed before a wetland 404 permit approval was feasible.

3 This statement alludes to the programmatic nature of a withdrawal decision which does not result in any direct environmental effects. However, the statement may appear confusing so it has been dropped from this paragraph.

APR 1 7 1997

BOARD OF COUNTY COMMISSIONERS

[illegible], Chairman
[illegible], Commissioner
[illegible], Commissioner
[illegible], Commissioner
[illegible], Commissioner

[illegible]

Commissioners' Office

April 15, 1997

John Thompson, BLM Team Leader
Larry Timchak, USFS Team Leader
Cooke City Area Mineral Withdrawal Team
222 North 32nd Street
P.O. Box 36800
Billings, Montana 59107

RE: Cooke City Area Mineral Withdrawal DEIS

Dear Mr. Thompson & Mr. Timchak:

1 The Board of County Commissioners of Park County, Wyoming, strongly objects to the proposed "Cooke City Area Proposed Mineral Withdrawal" because it violates a plethora of laws, regulations and policies already in existence, and it presumes that the agencies who have the responsibility of implementing and administering these laws, regulations and policies are ineffective.

2 *For Example*: The proposal is a significant departure from the current Forest Management Plans for the Custer and Gallatin National Forests, the Forest Service Minerals Program Policy issued in August, 1995 by the Chief of the Forest Service, and the proposed "Draft 1995 RPA Program" (Long-Term Strategic Plan) currently under review which includes minerals and energy exploration, development and production as an integral part of the Forest Service Management responsibilities for the area.

3 The proposal is contrary to the intent of Congress when it passed the Absaroka Beartooth Wilderness Act in 1978 in that the New World Mining District was specifically excluded from the Act because of the minerals potential.

2 The proposal violates the Federal Mining and Minerals Policy Act of 1970 which states, "It's the policy of all Federal Agencies to foster and encourage private enterprises in the development of economically sound and stable domestic mining... to help assure satisfaction of industrial, security and environmental needs."

1 A decision on a mineral withdrawal is not necessarily a statement about the adequacy of existing laws and regulations. Rather, it is a policy issue concerning the future land use in this area. Is mining an appropriate use of these federal lands given the other resource values present? The fact that proposed mining projects may comply with existing laws and regulations is an important consideration but not the only deciding factor in a withdrawal decision.

The study area has high values for many resources, is adjacent to Yellowstone National Park and two Wilderness areas, and forms the headwaters of Outstanding National Resource waters. The EIS describes the resources in this setting, and considers how mining could effect these resources. The Secretary of the Interior must balance the value of resources in the area against the potential benefits and consequences of future mining, taking into account pertinent laws and regulations.

2 The mineral withdrawal, if approved by the Secretary of the Interior, is a change in policy and direction for management of these specific lands, rather than a violation or departure from Forest Plans and other laws, regulations and policy.

As part of the proposed action (mineral withdrawal) which is described on page 3 of the EIS, the Custer and Gallatin National Forest Land and Resource Management Plans (Forest Plans) would be amended to include the mineral withdrawal. In addition, the Gallatin Forest Plan would be amended to reallocate areas within the study area currently allocated to Management Area 24 (minerals emphasis) to Management Area 15 (grizzly bear/dispersed recreation emphasis). The National Forest Management Act of 1976 (NFMA) and the implementing regulations at 36 CFR 219.10(f) provides an avenue for amending forest plans. The proposed amendments and other information relevant to the Custer and Gallatin National Forest plans is discussed in the final EIS, Chapter 3, under the section titled "Forest Plan Consistency".

The Forest Service Minerals Program Policy (8/3/95) and the 1995 Draft RPA Program establish policies, goals and objectives applicable to the Nation as a whole, not specific areas. While the proposed mineral withdrawal of the Cooke City area would not advance the minerals goals contained in these documents, it certainly does not preclude achieving the goals on a national scale.

3 **Wilderness Designation and Congressional Intent**- Congressional Reports on the establishment of the Absaroka Beartooth Wilderness recognized the known and potential mineral values of the area. The New World District was listed as high potential area for gold and copper. The area was not included in the Wilderness bill, nor was it withdrawn from mineral entry at that time (1978).

Wilderness designation and mineral withdrawals are two separate and distinct actions with different intent and consequences. Wilderness is designated by Congress under the authority of the 1964 Wilderness Act to preserve areas in a wild and primitive state. Mineral withdrawals are implemented at the discretion of the Administration, or through Congressional action, to withhold areas from mining in order to maintain other resource values present. Congressional action that resulted in establishing the nearby Absaroka Beartooth Wilderness does not preclude or restrict administrative actions such as a mineral withdrawal. Nor does a mineral withdrawal of non-wilderness lands result in future wilderness designation by Congress.

According to the withdrawal regulations at 43 CFR 2310, Congress can review and terminate a mineral withdrawal with a concurrent resolution within 90 days after the public land order is signed.

4 The protection of water quality is cited as one of the main reasons for the withdrawal proposal. The presumption is that water quality in Yellowstone is pure and pristine which is not the case. In fact, water flowing from Yellowstone already does not meet Clean Water Act standards, and its condition is not caused by mining. The current condition is the result of natural geologic processes, existing geologic formations and volcanic-related activity in and near the Park, and failure of Park managers to maintain game herds in balance with available forage.

5 The Board of County Commissioners of Park County, Wyoming certainly supports high water quality standards for domestic use and for fisheries, but there are already regulations and agencies in place to deal with water quality such as the Montana and Wyoming DEQ and the EPA. Similarly, the administration and protection of wetlands is already the responsibility of the United States Army Corp of Engineers. Thus the withdrawal proposal is redundant and unnecessary.

6 Of greatest concern to the Park County Commissioners is the aspect or undertone of Global Environmentalism.

Our concern is that the proposed withdrawal action violates the intent of NEPA since it serves to endorse and formulate much larger public land use policies without full public disclosure or congressional action.

The proposed action is an important piece of the land puzzle comprised of the Wildlands Project, the U.N. World Heritage Treaty, and the U.N. Biosphere Reserve Program. All three of these programs use protected areas, buffer zones and transition areas in their working documents. Relative to the proposed "Mineral Withdrawal" in the Greater Yellowstone Area, all of these proposals include or overlap the area encompassed by the proposed "Mineral Withdrawal."

The W.P., the U.N. World Heritage Treaty 1995 Draft RFA, and the U.N. Biosphere Reserve Program all call for a reduction of use and/or access. The W.P. is not a congressionally recognized policy, but the USDOI has employed one of its authors, Mr. Reed Noss, as a contractor and scientific advisor.

The World Heritage Treaty (YNP is designated a World Heritage site) comes into play with this proposed withdrawal because the action will partially create the "Buffer Zone" which the treaty allows if a heritage site is declared "in danger." This declaration was in fact done officially in Berlin, Germany in December of 1995.

4 Several comments were received indicating that existing water quality in the study area and in Yellowstone NP is impacted by natural mineralization to the extent that the incremental impacts of historical mining activities in the New World historical mining district is negligible. Although specific water quality data from pre-mining periods is not available, as mentioned in the surface water quality section — Affected Environment, Furniss (1996) has documented several acid seeps and springs which are naturally occurring in the upper Daisy, Fisher, and Miller Creek watersheds. It is generally recognized, however, that the rate of acid rock drainage had been greatly accelerated in the study area due to mining activities. The most water quality impacted areas (Daisy Creek and upper Fisher Creek) are located in the areas of most concentrated mining activity. As discussed in the Environmental effect section on surface water quality, the New World project poses potential water quality impacts which for which a variety of mitigation techniques were being developed. At the time of EIS suspension, a consensus was not yet reached between the agencies to the extent of potential water quality impacts or the extent or potential effectiveness of water quality mitigation.

5 See response #1.

6 The Park's status as a World Heritage Site and Biosphere Reserve was a public issue that required consideration in the EIS. Water from the study area flows into Yellowstone NP, and wildlife freely move between the study area and the Park. The EIS draws no conclusions concerning potential changes in the status of the Park as a World Heritage Site.

A mineral withdrawal is a tool available to the Administration and Land Management Agencies to withhold lands from mining to maintain other resource values in the area. Land management agencies, rather than interested individuals or groups, are responsible for applying for mineral withdrawals.

The authority for a mineral withdrawal decision lies with the Secretary of the Interior. The World Heritage Committee or the Biosphere Reserve Program have no jurisdiction or authority in regards to this decision. Neither the President, or any member of the Cabinet or Administration, indicated to the Forest Service or Bureau of Land Management, that the proposed withdrawal is part of a larger effort to formulate larger land use policies such as the Wildlands Project, the UN World Heritage Committee, or the UN Biosphere Reserve program.

A mineral withdrawal does reduce use and access for mineral related purposes. However, a mineral withdrawal does not reduce or preclude public access and use as well as other land uses of the area. For example, timber sales, watershed improvement, and recreation projects are not affected by a mineral withdrawal.

The U.N. Biosphere Reserve Program included Yellowstone National Park as a protected area in 1976.

7 The Biosphere Goals and Objectives (VI. Communications) specifically cite heritage areas as a national level mechanism to implement international programs. The Biosphere Reserve Program seeks to connect and strengthen a World Network of Biosphere Reserves managed for society as a whole. It appears that the seemingly isolated action has manifestations and implications far beyond that which meets the eye.

Therefore, for these and other reasons the Board of County Commissioners of Park County, Wyoming does not support the withdrawal of the Cooke City Area New World Mining District from mineral exploration, whether or not the *New World Mine* is implemented.

BOARD OF COUNTY COMMISSIONERS
PARK COUNTY, WYOMING

Charles W Johnstone
Charles W. Johnstone, Chairman

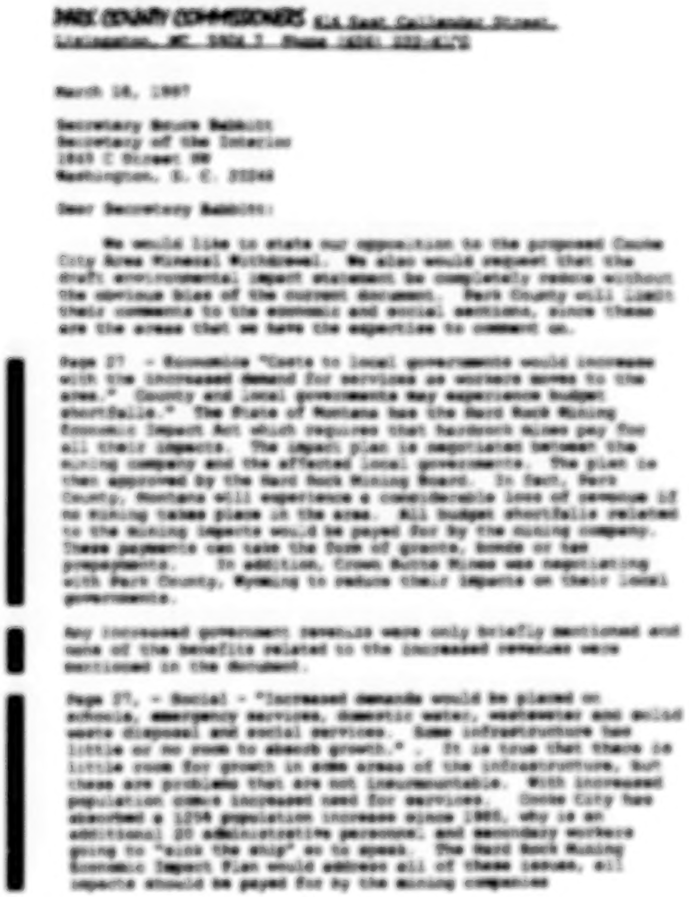
Beryl Churchill
Beryl Churchill, Commissioner

John J. Winninger, Commissioner

Timothy J. Morrison, Commissioner

cc: U.S. Senator Craig Thomas
U.S. Senator Mike Enzi
U.S. Representative Barbara Cubin
Paul Kruse, State Land and Farm Loan Office, Federal Land Policy

7 See response #6.



PARK COUNTY COMMISSIONERS 414 East Callender Street,
Livingston, MT 59047 Phone (406) 222-4170

March 18, 1997

Secretary Bruce Babbitt
Secretary of the Interior
1849 C Street NW
Washington, D. C. 20240

Dear Secretary Babbitt:

We would like to state our opposition to the proposed Cooke City Area Mineral Withdrawal. We also would request that the draft environmental impact statement be completely redone without the obvious bias of the current document. Park County will limit their comments to the economic and social sections, since these are the areas that we have the expertise to comment on.

1 Page 27 - Economics "Costs to local governments would increase with the increased demand for services as workers moves to the area." County and local governments may experience budget shortfalls." The State of Montana has the Hard Rock Mining Economic Impact Act which requires that hardrock mines pay for all their impacts. The impact plan is negotiated between the mining company and the affected local governments. The plan is then approved by the Hard Rock Mining Board. In fact, Park County, Montana will experience a considerable loss of revenue if no mining takes place in the area. All budget shortfalls related to the mining impacts would be payed for by the mining company. These payments can take the form of grants, bonds or tax prepayments. In addition, Crown Butte Mines was negotiating with Park County, Wyoming to reduce their impacts on their local governments.

2 Any increased government revenues were only briefly mentioned and none of the benefits related to the increased revenues were mentioned in the document.

3 Page 27, - Social - "Increased demands would be placed on schools, emergency services, domestic water, wastewater and solid waste disposal and social services. Some infrastructure has little or no room to absorb growth." . It is true that there is little room for growth in some areas of the infrastructure, but these are problems that are not insurmountable. With increased population comes increased need for services. Cooke City has absorbed a 125% population increase since 1985, why is an additional 20 administrative personnel and secondary workers going to "sink the ship" so to speak. The Hard Rock Mining Economic Impact Plan would address all of these issues, all impacts should be payed for by the mining companies

1 This statement in the summary has been modified to indicate that "Montana county and local budgets may be balanced by increases in tax base or by efforts that result from the Montana Hard-Rock Mining Economic Impact Act and the Proper Tax Based Sharing Act. County and local governments in Wyoming may experience budget shortfalls." The text also indicates that Crown Butte had agreed to help reduce the economic impacts to Park County, Wyoming. In addition, a summary of the Montana Hard-Rock Mining Economic Impact Act which applies to large-scale operations (those that would employ more than 75 workers) and the Proper Tax Based Sharing Act is included in Appendix G.

The impact on government finances for Park County, Montana is discussed in the Final EIS in Chapter 3, Section on "ECONOMICS," "Government Finances," "Environmental Effects." The effects of the Montana Hard Rock Mining Act are discussed in Chapter 3, "ECONOMICS," "Mitigation of Effects." Tables 3-13 and 3-14 show that reimbursement to Park County, Montana might be necessary for the first three years of a project.

2 The effects of the proposed action and its alternatives on government finances, including the effects of financing local school systems, are discussed in Chapter 3, "ECONOMICS, Government Finances, Environmental Effects" of the Final EIS. Tables 3-13 and 3-14 show that beginning in Year Four of a potential project significant net revenues would accrue to Park County, Montana, and Park County School District. By Year Six this would have reached approximately one million dollars per year. However, the decision to apply this surplus to the reduction of property taxes would have to be made by local government or voters. The conclusions from this analysis show that Park County, Montana, will realize more revenues and expenses from the result of mining, but Park County, Wyoming, would likely end up with a net loss.

Federal lands being withdrawn from mineral entry are not included in the present assessed evaluation of Park County Montana, or Park County, Wyoming. If Crown Butte's property is acquired by the federal government, and withdrawn from mineral entry, Park county, Montana, will lose the assessed valuation of that property. However, this will be the result of the land exchange proposal, not the mineral withdrawal proposal. It is also possible that the conversion of private to federal land would increase the amount of PILT payments to Park County, Montana. Added tax revenues and the Montana Hard-Rock Mining Economic Impact Act could fund new services or improve existing facilities or services. However, this would be more likely in Park County, MT than in Park County, WY. This is discussed in the social section relating to "Community Services and Infrastructure"

3 The Chapter 2 Comparative Summary of Impacts (Social) and the Chapter 3 discussions of infrastructure discussed under Community Services and Infrastructure, (Social) Effects has been modified. It is true that Montana's Hard-Rock Mining Impact Act requires the negotiation of an Impact Plan between the affected local governments and large-scale mines to identify the number of people expected to move into the affected area, the increased need for local government services and facilities, and the increased capital, operating and net operating costs that will result from the new mineral development. In this plan, the developer must commit to pay all increased local government capital and net operating costs identified in the plan. However, in the event that the developer does not meet the definition of a "large-scale" mine, which is that it employs more than 75 persons during any consecutive six month period, the developer would be exempt from these requirements.

4 Page 127 - The economic section consistently refers to twenty (20) miners (related to the Crown Butte Mine) moving into the Cooke City Area, when in fact they would be exclusively administrative and secondary personnel. All other workers would be housed in a work camp, including construction workers, their families would not be allowed to live in the Cooke City area (a condition of employment). These administrative personnel would almost certainly be transferred at mine closure and should have no effect on the unemployment rate of the area at mine closure.

5 While housing might be a problem, the cost of housing in the area is exorbitant right now, we would not expect any dramatic increase in costs. Seasonal workers live in sub-standard housing and have been known to camp out in the forest for the summer. An increase in secondary employees or the opportunity for workers to remain in the area year-round would result in employers providing better housing, or the construction of apartments for secondary workers that do not exist at this time.

6 Temporary shutdowns are a fact of life in any mining operation, and miners typically move from one mine to another. While it is true that income may be scaled back for some, most miners would move on to other jobs. This is what happened with the Mineral Hill Mine Closure in Gardiner, Montana. The miners places of residences for any mine located in the Cooke City area would be dispersed between Cody, Powell, Wyoming and Billings, Gardiner, and Livingston, Montana. All of these towns are large enough, that the overall economic impact should be minimal.

7 Page 129 - Concern about recreational losses due to overlapping effects of highway construction. I am not aware of any plans for highway construction with the exception of improvement of county roads into the area, that are mine related. The federal highway department has plans to reconstruct 212 from the park border to seven miles east of Cooke City. This construction will take place regardless of mining in the area with the resultant disruptions.

8 Page 146 - Yellowstone National Park has not requested that Park County assume full responsibility for any of the services that they currently assist Park County with.

9 Page 154 - states that mining ended in the area in 1942. This statement is absolutely false. Mining continued throughout World War II with the area producing copper, lead and zinc, all of which were considered essential to the war effort. (Robin McCullough, Montana Bureau of Mines) The availability of these minerals should also be taken into consideration. Today, gold is also used in many defense related uses including computer production and health related uses.

10 No where are the possible benefits of mineral development addressed in this environmental impact statement. Under the hard

4 Unemployment is discussed in the Final EIS in reference to the two county region. Regardless of the status (miner or administrative), a mine shutdown will have an effect on the spending patterns of the mine and its employees. Whether the employees leave the area or stay unemployed the change in spending will have indirect economic effects. If administrative employees leave the Cooke City/Silver Gate area the effect will be felt in the local retail and service sector. Whether they leave the area or not will have an effect on the unemployment rate but this is not discussed in reference specifically to the Cooke City/ Silver Gate

5 Comment noted. *No change to the text of the Final EIS is necessary.* The housing issue is discussed under "SOCIAL," "Housing."

6 The effects of temporary shutdowns are discussed in the Final EIS under "ECONOMICS," "Employment and Income." The geographic distribution of the mine workers is discussed under "SOCIAL," "Population," in the Final EIS.

7 A report prepared by Planning Information Corporation for the Park County Commissioners concerning the economic and social impacts of a New World Mine proposal states "according to [Wyoming Department of Transportation], Hwy 296/120 was not designed to accommodate heavy truck traffic, therefore the highway will have to be reconstructed". (*An Interim Report on the Potential Effects of the Proposed New World Mine on Socioeconomic Conditions in Park County, Wyoming,* March 5, 1997). Yellowstone NP plans to resurface the Tower Junction to Northeast Entrance road in 1997 (Mary Hektner, NPS, personal communication). The Montana portion of US 212 from Yellowstone NP to the Montana-Wyoming border is scheduled for reconstruction beginning in the year 2000.

8 This statement has been deleted from the text of the Final EIS.

9 A statement was added to the "History" section to acknowledge that mining occurred in the Cooke City area outside of the historically significant mining eras discussed in that section. A similar statement was added to the section describing the open mining era of 1934-1942.

10 The effects of mining developments on the infrastructure of the area are discussed under "SOCIAL," "Community Services and Infrastructure."

The effects on government finances are discussed under "ECONOMICS," "Government Finances." As referred to by the commentor, Montana's Hard Rock Mining Impact Act requires the negotiation of an Impact Plan between the mine operator and the affected local governments if the mine is considered "large scale." If however, the mine does not employ more than 75 persons for a consecutive six month period, it is not considered "large scale" and the requirements for the formulation of an impact plan do not apply. In such an instance, the cost of additional infrastructural needs would fall on Park County or the involved special districts.
Effects on water quality are discussed under "SURFACE AND GROUND WATER, WETLANDS, AND FLOODPLAINS," "Surface Water Quality."

Also the text has been modified to indicate that added tax revenues and the Montana Hard Rock Mining Economic Impact Act could fund new services or improve existing facilities or services. However, this would be more likely in Park County, MT than in Park County, WY. This is discussed in the social section relating to "Community Services and Infrastructure rock mining plan, mining companies would probably be required to build a new school, fund another teacher, possible provide sheriff's deputies for the area, fund another planner, help with development of on-site sewage systems, and pay for any other impacts to the Cooke City area. The benefits of good jobs, increased tax revenues, improvement of water quality due to the regulations governing hard rock mining are given no consideration in this document.

11 Another fact that seems to be completely ignored is that the Mineral Hill Mine which is the north border of the park has been a model of environmental efficiency. This mine also provided good jobs and a substantial tax revenue to Park County and is often cited for it excellent environmental record.

We will also forward these and any other comments to the EIS team based in Billings, MT.

Sincerely,

PARK COUNTY COMMISSIONERS

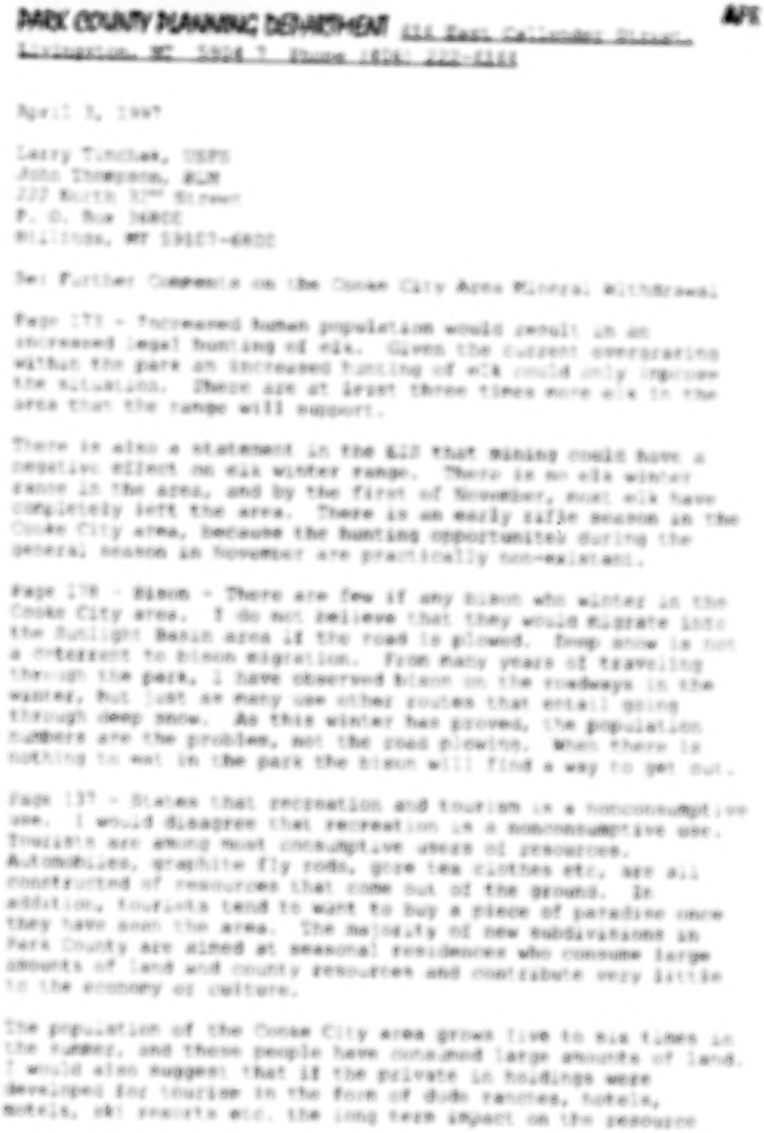
[illegible], Chair

Jim Hunt, Commissioner

Lee E. Schmidt, Commissioner

cc: Senator Conrad Burns
Senator Max Baucus
Representative Rick Hill
Ms. Katie McGinty
Governor Marc Racicot

11 While some commenters referred to examples of successful mines, others pointed out recent mine failures that have resulted in environmental degradation. While there are similarities between the Mineral Hill mine and the proposed New World mine, there are also differences. Differences include the potential for acid rock drainage, lack of year-round access, and reclamation potential. The EIS focus on whether mining of federal lands in the Cooke City area is appropriate. The variability of environmental settings, mining-related risk, and other factors makes across the board comparisons difficult.



PARK COUNTY PLANNING DEPARTMENT 414 East Callender Street, Livingston, MT 59047 Phone (406) 222-4102

APR 4 1997

April 3, 1997

Larry Timchak, USFS
John Thompson, BLM
222 North 32nd Street
P. O. Box 36800
Billings, MT 59107-6800

Re: Further Comments on the Cooke City Area Mineral Withdrawal

1 Page 171 - Increased human population would result in an increased legal hunting of elk. Given the current overgrazing within the park an increased hunting of elk could only improve the situation. There are at least three times more elk in the area than the range will support.

2 There is also a statement in the EIS that mining could have a negative effect on elk winter range. There is no elk winter range in the area, and by the first of November, most elk have completely left the area. There is an early rifle season in the Cooke City area, because the hunting opportunities during the general season in November are practically non-existent.

3 Page 178 - Bison - There are few if any bison who winter in the Cooke City area. I do not believe that they would migrate into the Sunlight Basin area if the road is plowed. Deep snow is not a deterrent to bison migration. From many years of traveling through the park, I have observed bison on the roadways in the winter, but just as many use other routes that entail going through deep snow. As this winter has proved, the population numbers are the problem, not the road plowing. When there is nothing to eat in the park the bison will find a way to get out.

4 Page 137 - States that recreation and tourism is a nonconsumptive use. I would disagree that recreation is a nonconsumptive use. Tourists are among most consumptive users of resources. Automobiles, graphite fly rods, gore tex clothes etc, are all constructed of resources that come out of the ground. In addition, tourists tend to want to buy a piece of paradise once they have seen the area. The majority of new subdivisions in Park County are aimed at seasonal residences who consume large amounts of land and county resources and contribute very little to the economy or culture.

The population of the Cooke City area grows five to six times in
the summer, and these people have consumed large amounts of land.
5 I would also suggest that if the private in holdings were
developed for tourism in the form of dude ranches, hotels,
motels, ski resorts etc. the long term impact on the resource

1 While elk densities may be high in surrounding areas, including Yellowstone NP, there is a relatively low population density of elk in the study area. Increased hunting pressure in the study are is not likely to have a measurable effect on the northern Yellowstone elk herd.

The MDFWP establishes the annual hunting season structure and harvest levels based on surveys and public comments. "Chapter 3," "WILDLIFE," "Food/Prey Base" states "... Harvest of elk and mule deer in the area has never been high and would not be expected to increase appreciably."

2 Elk winter range within the project area is shown on Map 3-18, Elk and Moose Winter Range and discussed in "Chapter 3," "WILDLIFE," "Mule Deer, Elk". Specifically "... Construction of a major mine could result in construction of a powerline corridor that would traverse portions of elk and mule deer winter range at the lower elevations. ... Wyoming Highway 296 passes through elk and mule deer winter ranges." Additional information on elk winter range is contained in the project file.

3 There are few bison present in the project area. The Final EIS states: "A few bison are present along Soda Butte Creek when snow conditions allow. Bison presence was recorded in the vicinity of Cooke City in late summer and early fall of 1994. ... Existing use of the study area is restricted to a few bison in the late summer and early fall."

Bison migration is a possibility and was identified as a concern though the scoping process. Areas free of snow such as plowed roads afford bison an easier travel route than areas containing snow depths that physically limit animal movement.

Examples of bison movements such as the Absaroka herd pioneering new range via groomed snowmobile trails and plowed roads during the winter were identified in Park Service reports. (National Park Service, Feb. 28, 1996; and Meagher, Sept. 12, 1994)."

4 The terms "consumptive use" and "nonconsumptive use" are unnecessary and have been deleted from the Final EIS. The sentence has been changed to read: "This dependence includes not only extractive industries such as mining, but also a high level of service oriented recreation and tourism business."

5 We agree that tourism (dude ranches, hotels, motels, and ski resorts, etc.) could have a potential impact on resources, however, recreation use is projected to increase regardless of whether or not there is mining. There is insufficient information to know what effect mining may have on the rate of that growth. Further the potential for new housing in Cooke City/Silver Gate is limited. Sections on the cumulative effects of development of private land have been added to the "Water", "Aquatics", and "Recreation" sections.

"Chapter 3," "SOCIAL," "Population" states: "Population growth related to recreation use is expected to increase with or without mining in the new World District. The effect mining may have on the rate of that growth is unknown. Recreational use could be affected in localized areas. Some users could leave and others could relocate to other areas. However, there is insufficient information available to accurately predict the net effect on the areas population."

See discussion under "Chapter 3," "SOCIAL," "Water, Wastewater, and Solid Waste Disposal". "A negotiated water rights agreement between Yellowstone NP and the Montana Reserved Rights Compact Commission was discussed earlier under Surface and Ground Water. This agreement prevents significant expansion of water delivery from existing sources by the Cooke City and Silver Gate systems."

"Chapter 3," "SOCIAL," "Housing": "... The lack of housing could be most evident in Cooke City and Silver Gate where the potential for new housing is limited by sanitary restrictions on septic tank development and high ground water. Privately owned tracts between Cooke City and Silver Gate have the highest potential for new housing in the immediate area of any potential mining activity."

In the "WILDLIFE" section under "Conclusion" a sentence was added: "Some effects from increased population, recreation, and tourism could also affect habitat regardless of whether mining activities occur in the project area."

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would exceed any mineral extraction, which takes place in a limited time frame.

4 The notion that tourism and recreation are nonconsumptive uses of land is one that needs to be rethought. The impacts are wide ranging and sometimes irreversible.

I hope that you will take these comments into consideration and rethink some of the statements in the EIS.

Sincerely,

Ellen Woodbury

Ellen Woodbury
Park County Planning Director

cc: Senator Conrad Burns
    Senator Max Baucus
    Representative Rick Hill
    Ms. Katie McGinty
    Governor Marc Racicot
    Secretary of the Interior

4 See response #4

STATE OF WYOMING
OFFICE OF THE GOVERNOR

GERINGER

APR 25

April 25, 1997

Cooke City Area Mineral Withdrawal Team
P.O. Box 36800
Billings, Montana 59107-6800

Dear Team Members:

The State of Wyoming appreciates this opportunity to comment on the Draft Environmental Impact Statement for the proposed Cooke City Area Mineral Withdrawal. While the area proposed for withdrawal lies wholly within the state of Montana, the decision to be made has potential impacts, both environmental and economic, within Wyoming.

1 Though this action is independent of the New World Mine Agreement, a decision to withdraw these lands would preclude options for location of the mine tailings pond should the Agreement not be implemented. For this reason, we request that a final decision on the withdrawal be withheld pending outcome of the New World Mine Agreement.

2 While this withdrawal could have some positive environmental benefits which may impact our state, it may also discourage development of mineral resources underlying federal lands in Wyoming. The precedent setting nature of this action is of particular concern. Were a similar withdrawal to occur in Wyoming it would have significant negative effects on development of our mineral resources and, therefore, on our economy.

3 It will also have more local effects. The Park County Commissioners have contracted for a study on the New World Mine Proposal which examines some of the impacts that action would have on the local area. Many of the impacts identified in that study are similar to those that would be caused by the instant proposal. Therefore, before making any final decision, we would strongly urge you to consider the points raised in that report, *An Interim Report on the Potential Effects of the Proposed New World Mine on Socioeconomic Conditions in Park County, Wyoming*.

We believe that the BLM has the necessary tools and professional expertise to manage mineral development in an environmentally sustainable manner. Withdrawals should occur only when unique conditions preclude mitigation of the environmental impacts of mineral development.

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1 The New World Project Environmental Analysis was halted as a condition of the New World Mine Agreement of August 12, 1996. Crown Butte Mines, Inc., the project proponent who was financing the preparation of the EIS, was a party to the Agreement.

A decision on the mineral withdrawal is anticipated for August of 1997. The third checkpoint for the New World Mine Agreement is also in August of 1997. The Secretary of the Interior may know the outcome of the NWM Agreement by the time the withdrawal decision is made. If the NWM Agreement is not resolved by August of 1997, the Secretary could make a withdrawal decision taking the facility siting issue into account, or he could defer the decision until outcome of the New World Mine Agreement.

If the segregation expires before a withdrawal is in place, it is reasonable to expect that additional claims would be filed in the area.

If the New World Mine Agreement is terminated, Crown Butte Mines, Inc., could reinstate their application and restart the NWP EIS.

2 A mineral withdrawal is a tool available to the Administration and Land Management Agencies to withhold lands from mining to maintain other resource values in the area. Withdrawals are discretionary actions within the authority of the President and the Administration. Typically, land management agencies, rather than interested individuals or groups, are responsible for applying for mineral withdrawals. However, the President, as well as the Secretary of the Interior, have the administrative authority to propose mineral withdrawals. The Cooke City Mineral Withdrawal, as well as other administrative withdrawals, are applied to specific tracts of federal land. A withdrawal of more than 5,000 acres requires Congressional review.

Any future mineral withdrawal proposals must comply with withdrawal regulations at 43 CFR 2310, including environmental analysis required by the National Environmental Policy Act (NEPA). NEPA provides for public participation in this process.

Mineral withdrawals, as well as revocations, are not unprecedented. Withdrawals for several federal land management agencies for the period of 1991 through 1995 are summarized as follows:

**ACRES OF WITHDRAWALS
AND REVOCATIONS FROM 1991-1995
FOR FEDERAL LAND MANAGEMENT AGENCIES**

AGENCY	WITHDRAWAL (Acres)		REVOCATION (Acres)	
	5 yr Total	Annual Avg.	5 yr Total	Annual Avg.
Bureau of Land Management	355,627	71,125	328,708	65,742
U.S. Forest Service	121,626	24,325	2,505	501
U.S Fish & Wildlife Service	2,882,917	576,583	0	0
Totals	3,360,170		331,213	

Note: The above figures are compilations of withdrawals and revocations that were administratively made by the secretary of the Interior. Source: Public Land Statistics, USDI, BLM 1991-95.

3 The report has been reviewed and content considered. Where appropriate, information in the report has been included and referenced in the Final EIS.

Cooke City Area Mineral Withdrawal
Page Two

Thank you for the opportunity to comment.

Sincerely,

Paul R. Knox
Assistant Director
Federal Land Policy Office

PK:jb

MAR 20 1997

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State Historic Preservation Office
Montana Historical Society
[illegible]

March 18, 1997

Larry Hamilton, BLM State Director
Hal Salwasser, Regional Forester
Cooke City Area Mineral Withdrawal Team
POB 36800
Billings MT 59107-6800

Dear Sirs:

Thank you for requesting our review and comment on the Draft EIS for the Proposed Cooke City Area Mineral Withdrawal. Our office has made previous comment under Section 106 of the National Historic Preservation Act wherein we agreed with USFS determinations of Eligibility for many properties in the area, and in the assessment by the USFS that Adverse Effects were likely in several development scenarios. We continue to agree with those findings. Further, we now concur with the assessments and analysis regarding the potential of Effect to cultural resources by scenario in the Draft EIS as summarized in Table 14., page 31, of the March 1997 Draft Summary of the EIS. We concur that Scenario B-2 appears least likely to Adversely Effect cultural resources.

Thank you again for requesting our comments.

Sincerely,

Stan Wilmoth

Stan Wilmoth, Ph.D.
Historic Preservation Officer

File G NF New World

Thank you for your review and comments. We appreciate your participation with us in this process.

DISTRIBUTION OF THE FINAL EIS AND SUMMARY

Copies of the Draft EIS/Summary were sent to federal, state, and local agencies; Native American Tribes; and individuals and organizations. The following is a list of agencies, organizations, and individuals that received the Final EIS/Summary.

CONGRESSIONAL - FEDERAL AND STATE

Governor Marc Racicot (MT)
Governor Jim Geringer (WY)

Senator Max Baucus (MT)
Senator Conrad Burns (MT)
Representative Rick Hill (MT)
Senator Mike Enzi (WY)
Senator Craig Thomas (WY)
Representative Barbara Cubin (WY)

(MT) House District 13-Joan Hurdle
(MT) House District 23-Alvin Ellis
(MT) House District 24-Robert Story Jr
(MT) House District 25-Shiell Anderson
(MT) House District 26-Bob Raney
(MT) House District 27-Jack Wells
(MT) House District 28-Rod Marshal
(MT) House District 29-Beverly Barnhart
(MT) House District 30-Emily Swanson
(MT) Senate District 12-James Burnett
(MT) Senate District 13-Lorents Grosfield
(MT) Senate District 14-C.A. Emerson
(MT) Senate District 15-Dorothy Eck

LOCAL GOVERNMENT

Big Timber Chamber of Commerce
Billings Chamber of Commerce
Bozeman Area Chamber of Commerce
Columbus Chamber of Commerce
Cody Country Chamber of Commerce
Cooke City/Silver Gate Chamber of Commerce
Livingston Chamber of Commerce
Red Lodge Chamber of Commerce
West Yellowstone Chamber of Commerce

Billings City Mayor
Bozeman City Mayor
Cody City Mayor
Columbus City Mayor
Laurel City Mayor
Livingston City Mayor

Red Lodge City Mayor

Carbon County Commissioners
Gallatin County Commissioners
Park County, WY Commissioners
Stillwater County Commissioners
Sweetgrass County Commissioners
Yellowstone Board of County Commissioners

Bozeman City Manager
Carbon County Planning Dept
Gallatin County Planning Dept
Park County, MT Planning Office
Sweetgrass County Planning Dept
Stillwater County Planning Dept
Sweetgrass County Planning Dept
Yellowstone County Planning Dept

STATE AGENCIES

MT Dept of Fish Wildlife & Parks
MT Dept of Env Quality
MT Dept of Natural Resources And Conservation
MT Field Solicitor's Office
MT Hard-Rock Mining Impact Board
MT State Historic Preservation Office
SD Dept of Env & Nat Resources
WY Federal Land Policy Office
WY DEQ
WY Dept of Environmental Quality
WY Game & Fish Dept

FEDERAL AGENCIES

Army Corps of Engineers
Council on Env Quality
DOI Office of the Solicitor
EPA Office of Federal Activities
Environmental Protection Agency, MT
Environmental Protection Agency, Region VIII
Environment Safety Occupational Health
HQ-USAF/LEEV
Library of Congress
Minerals Management Service
National Parks and Conservation Assoc
National Park Service
Office of Deputy A/S of the USAF
Office of Env Compliance (EH/23)
Office of Environmental Policy And Compliance
US Bureau of Reclamation
US Dept of Justice
USDA Office of the General Council
US Government Printing Office
US Geological Service
US Fish and Wildlife Service
Yellowstone National Park

TRIBAL

Crow Tribal Council
Crow Cultural Committee
Northern Cheyenne Tribe
Northern Arapahoe Tribe (WY)
Shoshone Bannock Tribe (ID)
Shoshone Bannock Cultural Committee (ID)
Shoshone Tribe (WY)

INDIVIDUALS, BUSINESSES, & ORGANIZATIONS

Howard Aasen
David Abdo
Absaroka Backcountry Horsemen
Absaroka Paradise Associates Inc
Roger Adams
James & Vernis Adams
Mrs Ladoska Addiance
Peter Aengst
John Aglitz
Clark Alexis
Glen Allen
John Hall Allen
Peter & Visty Allen
Dollie Alley
Alliance for the Wild Rockies
V Dean & Alice J Allred
All Seasons Hotel
American Wildlands
American Rivers
Dan Anderson (MN)
Dan Anderson (ND)
Dayan Anderson
James & Bettylou Anderson
David Anderson
Jeffrey Anderson
Ethel Anderson
Grace Anderson
Heidi Anderson
Richard D Anderson, M.D.
Richard Archer
Douglas & Judith Armstrong
Asarco Inc
Asarlo Inc
Mark Ayers
Paul Azevedo
Dan Bachman
Helen-Marie Bagstad
Keith Bailey
Hart Baitis
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Tripp Baltz
Frank Baner
Lenore Barnes
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Linda Barber
Carol Bardett
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Judy Barker
Tom Barker
William J Barmore Jr
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Charles Barney
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Heidi C. Barrett
Jim Barrett
Fred Bartz
James & Joan Bateman
J W Bateman
J Batezel
Battle Mountain Gold Co (TX)
Battle Mountain Gold Co (CO)
Erwin & Peggy Bauer
Marilyn Bauman
Dorothea Bayer
Lyle Bayers
Joseph Baylis
Bearcreek Council
Beartooth Alliance
Beartooth Land & Timber Co
Peter Beasley
Donald R Beck
Pat Beddow
Mary Beebe
Cody Beers
Evelyn Bell
James Bender
Jeffrey Berman
B a Bernard Trust
Ann Biastock
Big Bear Lodge Inc
Billings Gazette Wyoming Bureau
James Bird
James & Virginia Bird
Tom Bird
Jan Birdsey
Elizabeth Bischoff
Bill Bishop
Raymond Bishop
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Melissa Blackford
James Blackstone
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Roseanne Bloom
Andrew & Nikki Bobbitt
David Bole
Timothy Border
William Bormuth

Corrine Bovier
Gene and Beth Bowling
Warren Bowman
Bozeman Public Library
John & Lorene Branger
Bruce Brannick
Jane and Jack Braten
Bill Bratton
Mj Brennan
Elizabeth Brennan
Brimstone Mining
Stephen Born
Marilyn Brocopp
Edwards Rosser Brophy
Michael Broschart
Kenneth J Broskoskie
Harold Bross
Gary Brown
Krista Brown
Walter Brown
George Brown
Andre Hagenston Brown
Donald Browne
Cliff Browne
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Bud & Carmen Consolo
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Carol Cook
Debra Cook
R E & Jacqueline Cook
Robert E Cook
Riley Cooke
Cooke City School
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Ron Cooper
Corrie Cooperman
Frederick Copeland
Copper King Min Mil & Dev Co
David & Renee Coppock
Rob Corkran
Juliet Cortner
Jim and Karen Cossitt
Alan Counts
John Counts Jr
Silas Counts
Stephen Counts
Jim & Virginia Court
David Courtis
Neil Courtis

Fanny Coutts
Jim Covert
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James and Leslie Craudell
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E J & Judy Cregger
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James Crockett
Robert Cromar
Ted Cross
Crown Butte Mines, Inc. (WY)
Crown Butte Mines, Inc. (MT)
Crown Butte Mines, Inc. (NV)
Ken Cummins
Kevin Curry
Tad Dale
Frank and Kathy Danichek
Douglas Darling
Richard & Jeanne Davenport
Timi Davenport
Peter Davids
Joel Davidson
George & Jean Davis
Ronald Davis
P T Davis
Nancy Davlantes
Oliver & Goldy Dawson
Alfred Deaderick
Defenders of Wildlife
James Denison
Depuy-Glen #1 Inc
Louis Despres
John Dewitt
Marilyn Dinger
Vin Dipalma
Richard S Dipretoro
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Tom & Jennifer Dolese
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Marshall Dominick
Spencer Dominick
Kyle Donovan
Drake Farms Inc
Mr. & Mrs Elmer Drange
Scott Dreblow
Roger Dubia
Mary Rose Duffield
James & Agnes Duke
John & Barbara Durden
Ann Dutcher
Henry Dykema

Julie Earp
Eastern Montana College Foundation
Terry Easton
Jean Ebert
The Ecology Center
R R Edgmond
Gerald & Avis Edmonds
Richard & Ali Edwards
Bill Eikenberry
Bob Ekey
Russ Elliott
Dick Ellis
Michael D Ells
Energy Laboratories, Inc
Charles Eriksson Jr
Ero Resources Corporation.
Nancy McNamara Ervin
Euro-Nevada Mining Corp Inc
Doris Evans
Steven Evans
Matthew Everson
Mary Everson
Chase Ewald
Delmar & Sandra Fadden
Larry & Lauri Fahlberg
David Faley
Gene Farmer
Dianna Faulkner
Russell Faus
Adolph Favero
Federation of Western Outdoor Clubs
Bernard Feldkamp
Carol Ferguson
Angela Ferre
Arnold & Helen Ferris
Janice & Dennis Fettig
Gene Ficek
Louise S Fillion
Donald Fine
Jacqueline & Terry Fink
Lavonne Fink
Ann Finley
Dale Finn
Doris Fischer
Mary Fitzpatrick
Greta Zoe Flint
Clifford Flittie
Federation of Fly Fishers
Marie Fontaine
John R. Fontana
John & Angie Foos
Ray Ford
Robert T Forest
Dick Forehand
Raymond Fortuna
Dick Fox
Percy Frank

Jim Friedrich
H Paul Friesema
Donald & Patricia Froelich
William H Funk III
Mark Furd
Ernie Fuller Jr
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Gallatin County Backcountry Horsemen
Chris Gammons
Coleen Gamsby
Carol Gardina
Faye Garland
Gary Garton
Lelah Gates
Cynthia Benson Gee
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John Geddie
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John Gibson
Bob Gilbert
Mary Gillespie
Fran Gillette
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C Vincent Gilliland
Paul Gingras
Sue and Ralph Glidden
Marissa M Godoy
Ellen Goerler
Stiofain and Sherrie Goff
Walter and Heather Goldstein
Glenn Gordon
Tim Gossfeld
Vera Gottlieb
Fran Gough
Ann & Schlack Graham
Dean Graham
John & Miller Graham
Dorothy Gray
Brian Gray
Graystone
Great American Land & Cattle Co
Great Western Chemical Co.
Greater Yellowstone Backcountry Horsemen
Greater Yellowstone Coalition (MT)
Greater Yellowstone Coalition (WY)
Sylvia Gregory
Joan Griggs
Sid Grovenstein
Ben Grover
Ruth & Dave Gruhler
Orville Gustafson
Earl Haberman
Valerie Hafner
Dennis Hagenston
Chuck Haik

Darlene Haines
Ral W. Hall
Henry Hall
Bettilee & Tom Hallin
Wesley Hamilton
Karmen Hammermeister
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James and Carol Hansen
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Hobie Hare
Jason D Hargraves
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Albert Hawkins
Richard & Janett Hays
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Phoebe Herman
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Index Peak Corp
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Nellie Israel
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Joyce Johannsen
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Robert E and Delorale A Johnston
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James Jones
William Jud
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Montana Tech Library
Montana Tech. Dept. Of Geological Engineering
Montana Wilderness Assoc
Montana Audubon
Montana Petroleum Assoc
MT Bureau of Mines & Geology
MT River Action Network
MT Trail Riders Assoc
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Betty Morton
John & William Mouat
Mount Republic Chapel of Peace
Mount Republic Partnership
James R Mountain et al
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Tom Murphy
Andrea Murray
Raymond B Mus
Vincent E Mus
Faith Renee Myden
James Myers
Nickolos Myers
Charles and Deborah Myers
Philip Naro
Neal Nash
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National Wildlife Federation
Natural Resources Defense Council
Kenneth Naylor
Navratil, Unmack & Herring
Chuck Neal
Dennis Neill
Flora Nelles
Thomas & Maricela Nelson
Thomas and Karalee Nelson
Dennis Nelson
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Newcrest Resources Inc
Lois Nichol
Norman and Marilyn Nielsen
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Northwest Mining Association
Northwest Wyoming Resource Council
North West Parts & Rigging Co, Inc
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George Ohrstrom
John L Oldemeyer
Edward & Vickee Olds
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Lester Sunvison
James a Swaney
John Swanson
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Thomas Thompson
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Jay Johnson
Charly Tiernan
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Timber Trails
Edward Tymkin
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Paul Beckley	Economic	BS-Economics, CPA MF-Master of Forestry PhD(ABD)-Resource Economics	20
Rebecca Casillas	Mapping		17
Steve Christiansen	NEPA/Technical Coordination	BS - Forestry	18
Diana Enright	Public Involvement	BA - Journalism	7
Hank Finch	Recreation	BS-Forest Resources	20
Rita L. Frasure	Staff Assistant	BS-Geology	-
Dee Dee Green	Cultural	PhD-Anthropology	42
Jim Gruber	Geology/ Minerals Forecast	BA-Geology	21
Kathie Jewell	GIS Coordination	BS-Wildlife Science	15
Greg Kujawa	NEPA/Coordination	BS - Forest Management	17
Sherry L. Milburn	Public Participation Technical Coordination	BS-Education (Biology) MS-Counseling	20
Boje Nielsen	Recreation/Visual	BS-Natural Resources MLA-Master of Landscape Architecture	19
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APPENDIX A

FEDERAL REGISTER NOTICE OF PROPOSED MINERAL WITHDRAWAL AND FEDERAL REGISTER NOTICE OF AMENDMENTS TO THE PROPOSED MINERAL WITHDRAWAL

[Federal Register: September 20, 1996 (Volume 61, Number 184)]
[Notices]
[Page 49480-49481]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]

DEPARTMENT OF THE INTERIOR
[MT-960-1990-00-CCAM; MTM 84500]

Amendments to Proposed Withdrawal; Montana

AGENCY: Department of the Interior.

ACTION: Notice.

SUMMARY: The Department of the Interior, Bureau of Land Management, with concurrence from the Department of Agriculture, Forest Service, has amended the withdrawal petition and application for the proposed Cooke City Area Mineral Withdrawal to include additional Federal lands, non-Federal minerals within the withdrawal boundary which may be acquired by the United States, and segregation from mineral leasing, except oil and gas. This amendment will segregate the lands described below from location and entry under the mining laws and the mineral leasing laws, except oil and gas. This amendment will also segregate those lands in the original application from the mineral leasing laws, except oil and gas.

FOR FURTHER INFORMATION CONTACT:
Comments should be sent to the Cooke City Area Mineral Withdrawal Team, P.O. Box 36800, Billings, Montana 59107, by December 19, 1996.

SUPPLEMENTARY INFORMATION: On August 27, 1996, and September 13, 1996, petition amendments were approved, and on September 16, 1996, an application amendment was approved.

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These amend the original petition and application to include the following Federal lands and non-Federal minerals within the withdrawal boundary which may be acquired by the United States, and to withdraw the following lands and those in the original petition from mineral leasing, except oil and gas. The segregative period for all lands in this proposed withdrawal remains the same.

Principal Meridian, Montana

Federal Lands--

T. 15 E.,

Sec. 32, that part of SW\1/4\SW\1/4\ lying outside of the Absaroka-Beartooth Wilderness Boundary.

T. 9 S., R. 15 E.,

Sec. 21;

Sec. 22;

Sec. 23, lots 2 and 3, W\1/2\, E\1/2\SE\1/4\, and bed of Kersey Lake riparian to lots 2 and 3;

Sec. 26, bed of Kersey lake riparian to NW\1/4\NW\1/4\;

Sec. 27, lots 1 and 2, S\1/2\NE\1/4\, NW\1/4\, and bed of Kersey Lake riparian to lots 1 and 2;

Sec. 28, lots 1 to 4, inclusive, and 6 to 9, inclusive, S\1/2\NW\1/4\, S\1/2\SW\1/4\, and SE\1/4\SE\1/4\, and that part of lot 5 and SE\1/4\SE\1/4\ lying outside of the Absaroka-Beartooth Wilderness boundary;

Sec. 33, lots 1 to 4, inclusive, W\1/2\NE\1/4\, SE\1/4\NE\1/4\, and NW\1/4\, and that part of the NE\1/4\NE\1/4\ lying outside of the Absaroka-Beartooth Wilderness Boundary;

Sec. 34, lot 4, and that part of lot 3 and W\1/2\NW\1/4\ lying outside of the Absaroka-Beartooth Wilderness Boundary.

The areas described aggregate approximately 2,965.00 acres.

Non-Federal Minerals--Approximately 4,150.00 acres--

All non-Federal minerals, if returned to Federal ownership, would without further action become subject to the terms and conditions of the subject withdrawal.

The purpose of the proposed withdrawal is for protection of the watersheds within the drainages of the Clarks Fork of the Yellowstone River, Soda Butte Creek, and the Stillwater River, and the water quality and fresh water fishery resources within Yellowstone National Park. The amendments are to include lands identified during public scoping meetings and to meet the intent of the New World Mine Agreement signed August 12, 1996, by Crown Butte Mines, Inc., the Greater Yellowstone Coalition, and the United States.

A withdrawal application, as amended, will be processed in accordance with the regulations set forth in 43 CFR part 2300.

Existing uses of the segregated lands may be continued except for the location or relocation of mining claims during the pendency of the segregative period, including but not limited to all legal ingress and egress to valid mining claims and patented claims, all rights-of-way, all access to non-Federal lands, all current recreational uses, and all commercial uses requiring special use permits.

Thomas P. Lonnie,
Deputy State Director, Division of Resources.
[FR Doc. 96-24144 Filed 9-19-96; 8:45 am]
BILLING CODE 4310-DN-M

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[Federal Register: September 1, 1995 (Volume 60, Number 170)]
[Notices]
[Page 45732]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]

DEPARTMENT OF THE INTERIOR
[MT-930-1220-00; MTM 84500]

Notice of Proposed Withdrawal; Montana

AGENCY: Department of the Interior.

ACTION: Notice.

SUMMARY: The Department of the Interior proposes to withdraw approximately 19,100 acres of Federal lands for protection of the watersheds within the drainages of the Clark's Fork of the Yellowstone, Soda Butte Creek, and the Stillwater River, and the water quality and fresh water fishery resources within Yellowstone National Park. This notice segregates the land for up to 2 years from location and entry under the mining laws. The lands will remain open to mineral leasing.

FOR FURTHER INFORMATION CONTACT: Jeff Holdren, 1620 L Street NW, Washington, D.C. 20240, 202-542-7779.

SUPPLEMENTARY INFORMATION: On August 29, 1995, a petition was approved allowing the Assistant Secretary, Policy, Management, and Budget to file an application to withdraw the following described Federal lands from location and entry under the mining laws, subject to valid existing rights:

Principal Meridian, Montana

T. 8 S., R. 14 E.,
    Sec. 25, unsurveyed;
    Sec. 33, partly unsurveyed;
    Secs. 34 to 36, inclusive, unsurveyed.
T. 9 S., R. 14 E.,
    Secs. 1 to 28, inclusive;
    Secs. 33 to 36, inclusive, partly surveyed.
T. 8 S., R. 15 E.,
    Secs. 30 and 31.
T. 9 S., R. 15 E.,
    Secs. 5 to 8, inclusive;
    Secs. 17 to 20, inclusive;
    Secs. 29 to 32, inclusive.

The areas described aggregate approximately 19,100 acres in Park County, Montana.

The purpose of the proposed withdrawal is for protection of the watersheds within the drainages of the Clark's Fork of the Yellowstone, Soda Butte Creek, and the Stillwater River, and the water quality and fresh water fishery resources within Yellowstone National Park.

A withdrawal application, when filed, will be processed in accordance with the regulations set forth in 43 CFR 2300.

For a period of 2 years from the date of publication of this notice in the Federal Register, the lands will be segregated from location and entry under the mining law, subject to valid existing rights, unless the application is denied or canceled or the withdrawal is approved prior to the end of the segregation period.

Existing uses of the segregated lands may be continued except for the location or relocation of mining claims during the pendency of the 2-year segregative period, including but not limited to all legal ingress and egress to valid mining claims and patented claims, all rights-of-way, all access to non-Federal lands, all current recreational uses, and all commercial uses requiring special use permits.

Dated: August 29, 1995.
Thomas P. Lonnie,
Deputy State Director, Division of Resources.
[FR Doc. 95-21888 Filed 8-31-95; 8:45 am]
BILLING CODE 4310-DN-P

APPENDIX B
LOCATABLE MINERAL RESOURCES FORECAST FOR FUTURE MINERAL ACTIVITY

INTRODUCTION

Purpose

The purpose of this Forecast for Future Mineral Activity is to provide a hypothetical model for future locatable (hardrock) mineral activity within the boundaries of the proposed 22,000 acre Cooke City Area Mineral Withdrawal. The forecast addresses the potential for future mining and will be used to analyze possible impacts to other resources which in turn will help determine the need for a mineral withdrawal.

Scope

This forecast represents the current management situation identified in the Gallatin and Custer Forest Plans which provides for claim staking, exploration, and mining under the General Mining Law of 1872 and other applicable laws and regulations. It does not reflect the recent changes in management conditions relating to the NWM Agreement of August 12, 1996. The forecast presents the type and level of locatable mineral activity that may take place in the absence of a withdrawal and in the event that the Agreement does not materialize. In other words, the forecast depicts the maximum level of mineral activity to be analyzed in the withdrawal EIS.

The forecast is based on identified mineral reserve and undiscovered mineral resource capabilities of the lands involved, and applies conditions and assumptions with, for the most part, geologic data that are insufficient for defining ore bodies. Economic and regulatory conditions, and land ownership considerations are also factored into this analysis. With the exception of Crown Butte's mine proposal, this forecast does not constitute proof that mineable mineral deposits are present or absent. The type and level of activity identified in this forecast is subject to changes in available geologic data and technology as well as changes in economic, administrative, and legislative conditions.

Within the boundaries of the proposed withdrawal of 22,000 acres of federal land is approximately 4,160 acres of private land. About 3,315 acres of this private land was patented as mining claims and represents the majority of historic mining activity noted in Reed (1950) as well as Crown Butte's recent exploration activities and their suspended mining proposal. The area in the center of the proposed withdrawal containing the highest density of patented lands (mixed with unpatented claims) coincides with the area having the highest mineral development potential (Map 3-11). Current unpatented mining claims, most of which are in the same vicinity of high density patented lands, consist of 272 lode claims (~3,165 acres), 202 mill sites (~1,010 acres), and 3 placer claims (~65 acres).

LOCATABLE MINERALS ADMINISTRATION

General Mining Law of 1872

Under the mining law a U.S. citizen has a statutory right to go on unappropriated and unreserved federal lands for the purpose of mineral prospecting, exploration, development, and extraction of locatable minerals. The basic elements of the law consist of discovery of a valuable mineral deposit, location, recordation, and maintenance of mining claims, and patenting.

All National Forest System lands which were formerly public domain lands that have not been appropriated, withdrawn, or segregated from location and entry and have been or may be shown to be mineral lands are open to prospecting for locatable, or hardrock, minerals (16 U.S.C. 482). In prospecting, locating, and developing the mineral resources, all persons must comply with the rules and regulations covering the National Forests (16 U.S.C. 478).

Mining and Mineral Policy Act of 1970

It is the policy of the Federal Government, in the national interest, to foster and encourage private enterprise in "the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals."

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Organic Administration Act

In as much as the General Mining Law and the Mining and Mineral Policy Act establish mineral development rights and objectives, all activities associated with mining must be conducted in accordance with all Federal, State, and local laws and regulations governing mining operations and environmental protection. The Forest Service must provide for reasonably necessary mining activity while protecting and minimizing effects on other resources in accordance with regulations governing mining found in 36 Code of Federal Regulations (CFR) 228, Subpart A.

Surface Management Regulations (36 CFR 228, Subpart A)

The regulations require that operations conducted under the authority of the mining law which might cause significant surface resource disturbance must be covered by an operating plan approved by the Forest Service. Certain activities of little impact, generally non-mechanized disturbance, are specifically exempt from the operating plan requirements.

Montana Metal Mine Reclamation Act

The Forest Service works cooperatively with the Montana Department of Environmental Quality (DEQ). The DEQ administers the Montana Metal Mine Reclamation Act. The purpose of this law is to prevent land and surface water degradation by requiring lands disturbed by mining to be stabilized and reclaimed. The Act requires an approved operating permit for all mining activities which disturb more than 5 acres or mine more than 36,500 tons of ore annually. This law applies to all hardrock mining in Montana, regardless of whether it is proposed on Federal (non-Indian), State, or Private lands.

TECHNOLOGY

Advances in technology are expected to have a substantial effect on future mineral exploration and development. In light of these expectations, advances in geophysical and geochemical survey methods and procedures will take place at a rapid rate. Computerization of exploration data will increase as more sophisticated geologic modeling methods become available to the average user. Large advances in satellite imagery, and utilization of remote sensing data, will be made as more and better equipment are placed into orbit. The effect of these advances will be a more accurate and rapid evaluation of regional and local areas with better discrimination of geologic targets, and a more accurate assessment of mineral deposit potential.

Mining and mineral processing efficiency will continue to improve in the future. This is due to advances in general technology becoming available to the mining industry. A large amount of knowledge will continue to be gained with experience. This may be especially true in the area of heap leaching technology which is barely two decades old. Reclamation has come of age in the last 15 years in response to growing environmental concern. Reclamation science will continue to advance as a result of experience and research. More detailed design effort will be placed on reclamation of mined lands in the future. This will result in an overall increase in reclamation costs. These costs should pay dividends in the long-term with increased reclamation success.

LEGISLATIVE CHANGES

There are several areas of potential legislative change that may affect how hardrock mineral resources are developed. The first is the ongoing effort to amend, repeal, or reform the General Mining Law of 1872. Since 1990, numerous bills have been sponsored by both parties in the Senate and House of Representatives. This effort could result in anything from simply leaving things as they are, to a complete restructuring into a leasing/royalty system similar to that now used for coal or oil and gas. The effect of major changes in the mining law on mineral activity could be a decrease in the amount of exploration activity undertaken by small operators. Another perhaps more extensive effect would be a decrease in the ultimate number and size of mines that could be developed. This is because a royalty on mineral production would generate a corresponding increase in operating costs which in turn would raise the cut-off ore grade making some currently economic deposits uneconomic, or reducing the size or mineable depth of other deposits.

Another area of possible legislative change is in environmental laws or regulations which would affect exploration and mining activity. There is an increased level of public awareness on environmental matters which is expected to continue into the future. Prevailing public attitude may result in stricter mine permitting requirements for state and federal agencies. The effect of more stringent requirements could be increased mine permitting and operating costs. This may cause some marginal operations to become uneconomic.

For purposes of analysis it is assumed that none of these potential legislative changes will have an appreciable affect on the level, or amount, of mineral activities in the Cooke City area. It is also assumed that proposed operations will be scrutinized more thoroughly and compliance requirements will be subjected to higher standards in this area due to its proximity to Yellowstone NP, the A-B Wilderness Area, and the Clarks Fork Wild and Scenic River corridor.

COMMODITY MARKETS

Gold, copper, and silver are the commodities that are of interest to the mining industry in the Cooke City area at the present time. Supply and demand for these metals are discussed in this section. Other commodities that may be of interest in the future in this area are molybdenum, lead, and zinc. For the purposes of this analysis the price of these six commodities are assumed as follows, in 1996 dollars.

Gold	- $380/ounce
Silver	- $5.30/ounce
Copper	- $1.20/pound
Molybdenum	- $3.20/pound
Lead	- $0.35/pound
Zinc	- $0.50/pound

Supply and Demand for Gold. Gold is produced and used on a world- wide basis. Global gold supply in 1993 was estimated to be 3,538 tons (Gold Fields Mineral Services, Ltd., 1994). Mine production contributed about 65 percent of the supply, with official sales, gold scrap, and miscellaneous sources providing the remainder. Domestic mines continued to produce at near record levels during 1994, maintaining the United States' position as the world's second largest gold-producing nation, after the Republic of South Africa. U.S. production of 330 tons in 1994 account for about 15 percent of world-wide gold production (U.S. Bureau of Mines, 1995). In the U.S. in 1994, gold was produced from about 200 lode mines, about a dozen large placer mines, and numerous small placer mines.

The importance of gold as a store of wealth, including its role in world monetary systems, is the principal driving force that leads to efforts to find and produce more gold. From its use as an article of adornment, it grew to be a stable item of trade and eventually became what is now called money.

With the organization of industrialized nations and the development of international commerce, gold became the primary instrument for settlement of international debt, whether used in direct payment, or as backing (officially or de facto) for national currencies. Thus, gold is accumulated and held as reserves by national banking institutions, the so-called central banks.

Of the total gold available in the world today - which represents virtually all the gold that has ever been mined - about one-third is held by national central banks and other official agencies, such as the World Bank and the International Monetary Fund, as a support for monetary systems. Another third is held in private hoards, as a hedge against inflation and sudden domestic or international instabilities, or for speculation purposes. The other third is in jewelry (in some respects a store of wealth) and in other fabricated uses such as in the electronic industry and dentistry (USGS, 1988).

Supply and Demand for Copper. Since 1980, U.S. consumption of refined copper has ranged from 1.8 to 2.4 million tons (Marshall, 1993). Worldwide consumption of copper reached 10.8 million metric tons in 1991. Electrical uses are the dominant domestic copper use; consumption of copper in electrical applications has increased both in absolute and relative terms (Marshall, 1993). Other copper uses, such as in construction, machinery, and transportation, have remained stable or decreased during the past decade.

In 1994, domestic copper production from mines was 2 million tons, continuing a decade-long upward trend. About 50 copper mines operated in the U.S. in 1994. Recycled copper from old scrap in 1994 provided about 20 percent of apparent domestic consumption. World copper production was an estimated 9.3 million tons (U.S. Bureau of Mines, 1995).

Supply and Demand for Silver. U.S. demand for silver has decreased since 1985, with apparent U.S. demand for silver decreasing from about 7,000 tons in 1985 to 4,500 tons in 1994 (U.S. Bureau of Mines, 1995). Net imports of silver also decreased from 4,500 tons in 1985 to 2,200 tons in 1994. An estimated 2,200 tons of silver was recovered from recycled materials in 1994. Photography continued to be the largest single use of fabricated silver, accounting for just over 50 percent of the total demand. Electronics and batteries comprised about another 20 percent to total demand. Jewelry, silverware, coins, and miscellaneous other uses accounted for the remaining demand (U.S. Bureau of Mines, 1995).

Silver was produced by about 120 mines in 18 states. Total domestic mine production in 1994 was an estimated 1,400 tons. In the U.S., more silver was recycled from old scrap in 1994 than mined. World silver production was an estimated 14,000 tons (U.S. Bureau of Mines, 1995).

HISTORICAL AND CURRENT MINERAL ACTIVITIES

The first discovery of valuable minerals in the Cooke City area was in 1869. In 1870, prospectors located claims on Miller Mountain and Republic Mountain, to the north and south of Cooke City, respectively. During the period of 1875 to 1887, small amounts of lead, silver, and zinc were produced from the New World mining district. From 1888 to about 1930, copper-gold ore was produced sporadically from several small mines and prospects that included the Little Daisy, Homestake, Glengarry, and Alice E. mines. The Republic mine was also worked intermittently during 1906-20. During 1920-52, the Irma and Republic mines were small but consistent producers of lead-zinc-silver ore. Several other properties, including the Homestake mine, had minor to moderate production during the 1940's and 1950's.

The most significant production in the district came from the McLaren Gold mine, which commenced small-scale operations in 1933. The mine was a consistent producer from about 1938 to 1953, when the mill burned and the mine closed.

The total reported production for the New World district is 62,311 ounces of gold; 692,386 ounces of silver; 1,963,800 pounds of copper; 3,242,615 pounds of lead; and 920,200 pounds of zinc. Nearly all of the gold and copper came from the McLaren Gold mine (Elliott, et al, 1992).

Several companies explored the New World district for large tonnage porphyry copper-molybdenum deposits from 1962-1982. The Como gold-copper-silver deposit was identified and drilled during the period 1962-1973. Subsequent drilling during 1981-1982 identified probable reserves of 435,700 tons containing 0.170 opt Au, 0.75 opt Ag, and 1.31 pct Cu in the Como area (Elliott, et al, 1992).

Exploration since 1987 has focused on identifying resources in sediment-hosted skarn and replacement deposits (i.e., concentrations of minerals formed by reactions of cooling magma with limestone) adjacent to altered and weakly mineralized intrusions.

MINERAL POTENTIAL

Discovered Ore Deposits

In 1987 Crown Butte Mines, Inc., identified new reserves in the McLaren deposit area. Exploration drilling led to discoveries of the Fisher Mountain deposit in 1988, the Miller Creek deposit in 1989, and the Homestake deposit in 1990. Total exploration and development drilling by Crown Butte between 1987-92 is 295,375 feet in 824 holes. Geologic ore reserves defined by Crown Butte are shown in Table B-1 and Figure B-1.

A significant shift in the ratio of open pit to underground reserves took place as a result of drilling in 1990-91. Prior to 1990, all of the reserves were contained in the open pit reserves of the Como and McLaren deposits. However, underground reserves currently account for 73 percent of the tonnage of ore and 87 percent of the contained gold (Elliott, et al, 1992).

TABLE B-1. GEOLOGIC ORE RESERVES IN GOLD-COPPER-SILVER DEPOSITS, NEW WORD DISTRICT (ELLIOT, ET AL, 1992)

Deposit	Tons	Ounces Au	Pounds Cu	[illegible]
Como	707,318	77,805	14,570,750	386,195
Fisher Mtn	334,200	63,164	1,871,520	377,646
McLaren	2,171,035	197,564	30,394,490	827,164
Miller Cr	2,218,368	858,508	38,599,603	3,416,286
Homestake	6,600,966	1,478,616	93,733,717	5,478,801
Average grade		0.222 opt	0.75 pct	0.870 opt
Total	12,031,887	2,675,657	179,170,080	10,486,092

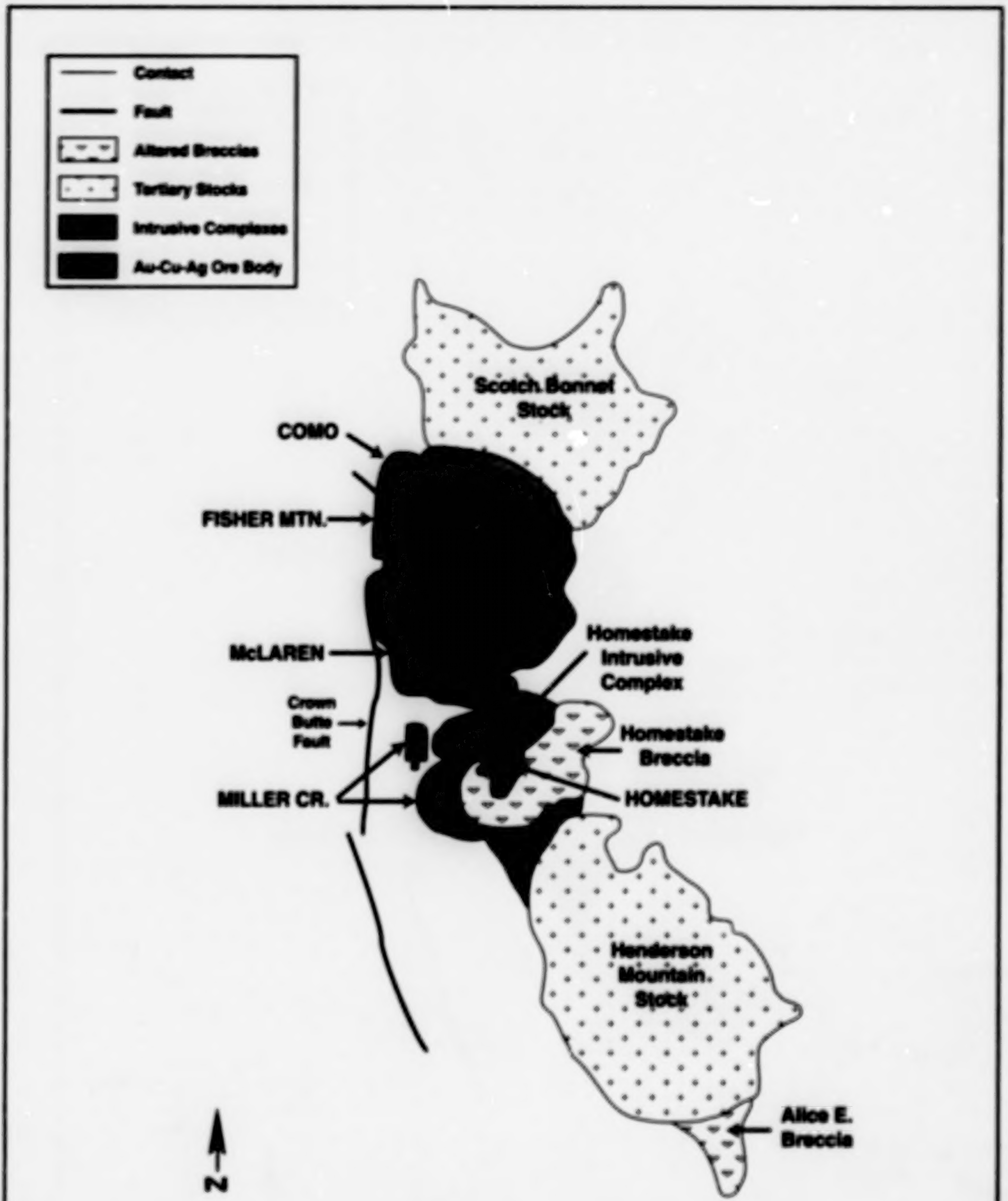

FIGURE B-1. Map showing the locations of identified gold-copper-silver ore deposits, main intrusive complexes and stocks, and breccia pipes (after Elliott et al, 1992).

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Undiscovered Ore Deposits

Undiscovered ore deposits are likely to be similar to gold-copper-silver skarn deposit types that have been discovered recently and polymetallic base metal (lead, zinc, & silver) vein deposit types that have been mined in the past. Deposits mined or explored in the past for copper have the potential to be reexamined for precious-metal (gold and (or) platinum) potential. Reworking of old placers and reevaluation of previously delineated placer gold occurrences are a possibility.

Other mineral deposit types present in the area are less prospective at the present time because of economic factors. Porphyry copper deposits may be too low grade (depending on trends in copper prices) to be mined only for copper, but may be examined for other commodities such as gold.

The U.S. Geological Survey (USGS, 1993) has identified 10 mineral resource tracts (i.e., areas that represent a synthesis of the current state of geologic knowledge of the New World mining district) within the study area that are permissive for the occurrence of various types of undiscovered mineral deposits. Many areas that were explored in the past, mainly for copper and molybdenum were not thoroughly evaluated for their gold or platinum group potential at that time. Other commodities of possible interest include nickel, arsenic, lead, zinc, silver, and iron. The more favorable areas within permissive tracts equate to high occurrence potential for undiscovered ore deposits as defined by the BLM for this analysis (Maps B-1, B-2, B-3, and B-4). With the exception of the Kersey Lake extension, all of the study area possesses high occurrence potential for one or more ore deposit types. Areas where potential porphyry copper-gold-molybdenum deposits overlap skarn deposits and polymetallic vein deposits are considered to have the highest occurrence potential.

FORECAST FOR FUTURE MINERAL ACTIVITY

Reed (1950) indicates that prior to 1950, there were 13 mines in the New World Mining District. All of these mines were relatively small underground precious and base metal operations with the exception of the McLaren open pit gold and copper mine - the most significant producer in the area to date.

Presently, the area of high occurrence potential for gold-copper-silver skarn deposits (Map B-1) possess high development potential, (Map 3-11). In addition, the favorable area for undiscovered ore deposits of porphyry copper-gold-molybdenum exhibits high development potential (Map B-2, Map 3-11). Polymetallic vein occurrences (Map B-3) exhibit high or moderate development potential and the alkaline gabbro-syenite tract (Map B-4) has moderate development potential (Map B-1). By definition, development potential relates to a mineral occurrence or potential occurrence that is likely to be explored or developed within the next 20 years given the geologic and nongeologic assumptions and conditions specified in this report.

Mineral exploration is based on the premise that an eventual discovery will result in a mine that makes the effort worthwhile. As a generalization, statistics show that several hundred favorable sites for ore mineralization lead to one orebody. If indications are strong enough for detailed surface investigation, the odds are 1 in 100; if a site is attractive enough to drill, the odds are 1 in 50; after ore-mineralization has been verified, the odds are 1 in 10 of finding an orebody (Peters, 1987). For the purposes of this report the terms orebody and mine are used interchangeably and defined as "a mineral deposit that can be worked at a profit under existing economic conditions".

The statistics borrowed from Peters, 1987, are used in this forecast to illustrate relative probabilities for the combined future mineral activity that could occur within the study area (Table B-2). These numerical values do not necessarily reflect the odds or percent probability of a singular activity occurring.

Ore reserves are displayed in Table B-1. The Miller Creek and Homestake deposits make up Crown Butte's mine proposal and the odds of mining are greater than 1 in 10. The Como, McLaren, and Fisher Mountain deposits have been extensively drilled and their probability of being mined is 1 in 10.

In addition to ore reserves identified in Table B-1, Crown Butte Mines, Inc. conducted an extensive exploration program from 1989 through 1993 in search of mineral deposits of gold, copper, and silver in the New World mining district. Of the 12 exploration targets, 7 were dismissed without any drilling and 4 were discontinued with only limited drilling (FS and DEQ, 1996), thus the odds of locating an orebody as a result of this exploration are more speculative than 1 in 50. The remaining target (Daisy Pass Pod) was extensively drilled and is being evaluated as Stage 2 reserves in the mine proposal and has a greater than 1 in 10 likelihood of being mined.

Descriptive models used by the U.S. Geological Survey (USGS, 1993) to identify favorable areas for undiscovered ore deposits in this area are based on very little if any drillhole data. The forecast assumes that 10 exploration

TABLE B-2 - FORECAST FOR FUTURE MINERAL ACTIVITY

	Estimated Size	Estimated Duration	Estimated Number	Percent Probability*
Exploration	< 1 ac.	Continaous	NA	>> 1 in 10
Exploration (drilling)	4 ac.	2-3 yrs.	10	> 1 in 10
Crown Butte (proposed mine)	180 ac.	12-20 yrs.	1	> 1 in 10
New Mine (open pit)	200-400 ac.	8-15 yrs.	1	1 in 10
New Mine (underground)	75-200 ac.	8-15 yrs	1	> 1 in 50

* Relative probability (see text for discussion)

drilling programs could occur within the next 20 years and that drilling could identify 1 underground mine, thus the likelihood of a mine occurring in the future based on these models and the drilling forecast is greater than 1 in 50.

Forecast Summary

The geologic setting, past activity, the Crown Butte mine proposal, and the large number of patented (~3,315 acres) and active unpatented (~4,240 acres) claims indicate continued exploration is highly likely to occur throughout the study area. The relative interest of this area to the minerals industry and it's potential for mineral development will depend largely on commodity prices and social concerns more so than geologic factors. Forecasts derived in this report (Table B-2) are based on the author's examination and assessment of these combined geologic and non-geologic factors and conditions.

Mining targets in the near future are likely to focus on precious metal deposits and may shift to base metals in combination with precious metals. High capital-investment, medium to large scale, underground mining will dominate industries interest. Medium-scale bulk tonnage (open pit) mining is a possibility.

The only significant producer in the area, the McLaren open pit mine (gold-copper), was a small-medium sized bulk tonnage operation that ran for 15 years before closing in 1953. Crown Butte Mines, Inc. began exploring in the late 1980s and is currently in the process of permitting (permitting is presently suspended) a small to medium-size underground gold-copper-silver mine with a 12-20 year mine life. Assuming similar or more refined exploration technology in the future and similar or more stringent mine permitting requirements, along with stable gold prices and/or increases in base metal prices, there is varying probability (Table B-2) that one of each medium-sized underground and open pit metal mine (in addition to Crown Butte's proposal) could be developed within the proposed withdrawal area in the next 20 years.

Undiscovered deposits that may lead to mines would likely occur west of the easternmost boundary of where skarn deposits have high occurrence potential (Map B-1) and most likely within the area overlapped by porphyry copper-gold-molybdenum potential. For analysis purposes, based on typical present-day mining operations, it is assumed that any underground or open pit mine in the area would disturb approximately 75-200 and 200-400 acres, respectively, with a mine life of 8-15 years each. About 200 workers would be employed at each mine during full production. Long-term total payroll at each mine would be $6.5 million per year, in 1996 dollars. Due to the amount of lead time needed for exploration and permitting, neither of the two hypothetical new mines are likely to be in full operation at the same time or within the next eight years.

Exploration is forecasted to take place continuously for the projected future, consisting mainly of mapping, and geochemical and geophysical surveys, all of which create negligible surface disturbance. There is a potential for 10 drilling programs averaging 20 drillholes each and 4 acres

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of disturbance each (including access). Portable track-mounted or buggy-mounted drill rig and some helicopter use could be expected. Development drilling may occur and could include 700 holes for each of the 2 new mines that are forecasted.

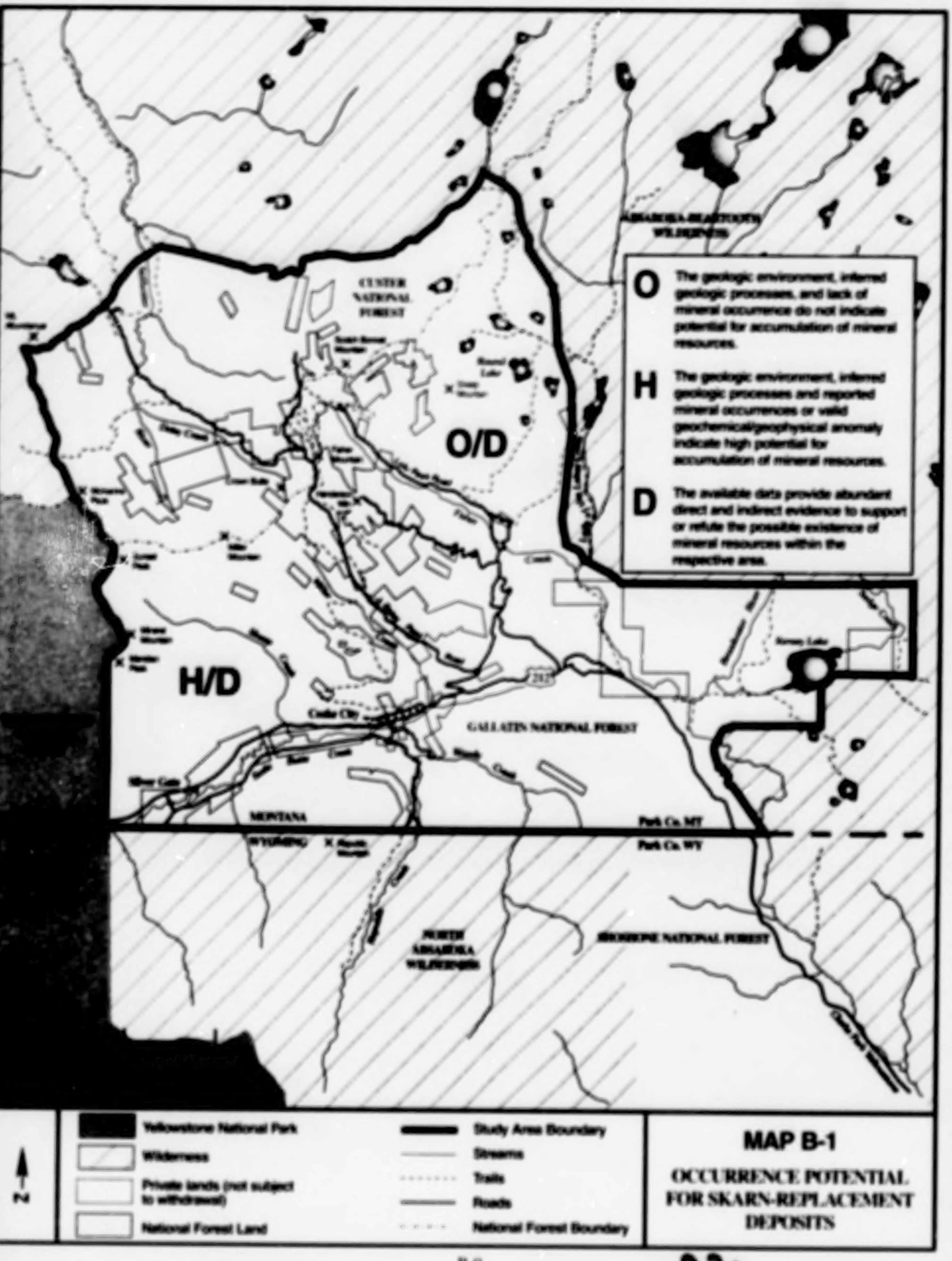
Custom mills and/or on-site smelters are not foreseen. The two hypothetical mines that are forecasted may utilize Crown Butte's proposed infrastructure, such as the powerline, work camp, and buildings, thus reducing capital costs and acres of disturbance.

The probability of this future exploration and mining activity occurring on patented land within the 22,000 acre study area is greater than on NF lands given the area with the highest mineral potential contains the highest density of patented claims (see Land Status in this report) and the fact that, by definition, patented claims are mineralized. However, most lands within the study area have varying degrees of high occurrence and development potential, thus, available federal lands would increase the odds of finding orebodies and industry interest in federal land is expected to continue.

The above forecast reflects the current management situation identified in the Gallatin and Custer Forest Plans that provide for claim staking, exploration, and mining under the General Mining Law of 1872. In the event of a withdrawal about 4,240 acres of active claims (272 lode, 202 mill sites, and 3 placer claims) would be subject to existing rights which would allow mining activity on valid claims. In addition, mining activities would be allowed to continue on approximately 3,315 acres of patented mining claims within the study area.

The mining law provides extralateral rights to the owner of patented lode claims and valid unpatented lode claims. These rights belong to such lode claims for mineralized veins that apex within a claim and extend downward beyond the claim's vertical limits. In the event of a withdrawal, extralateral rights may extend the frontier of future mining activity beyond the boundaries of patented or valid unpatented lode claims, however, surface rights do not extend beyond the vertical limits of the actual claim and surface disturbance would most likely be confined to the actual claim.

For NEPA analysis purposes only, it is assumed that most current unpatented claims will not be developed and that extralateral rights will not significantly extend mining activity beyond the boundaries of patented claims or any unpatented claims with valid existing rights.



O The geologic environment, inferred geologic processes, and lack of mineral occurrence do not indicate potential for accumulation of mineral resources.

H The geologic environment, inferred geologic processes and reported mineral occurrences or valid geochemical/geophysical anomaly indicate high potential for accumulation of mineral resources.

D The available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral resources within the respective area.

MAP B-1

OCCURRENCE POTENTIAL FOR SKARN-REPLACEMENT DEPOSITS

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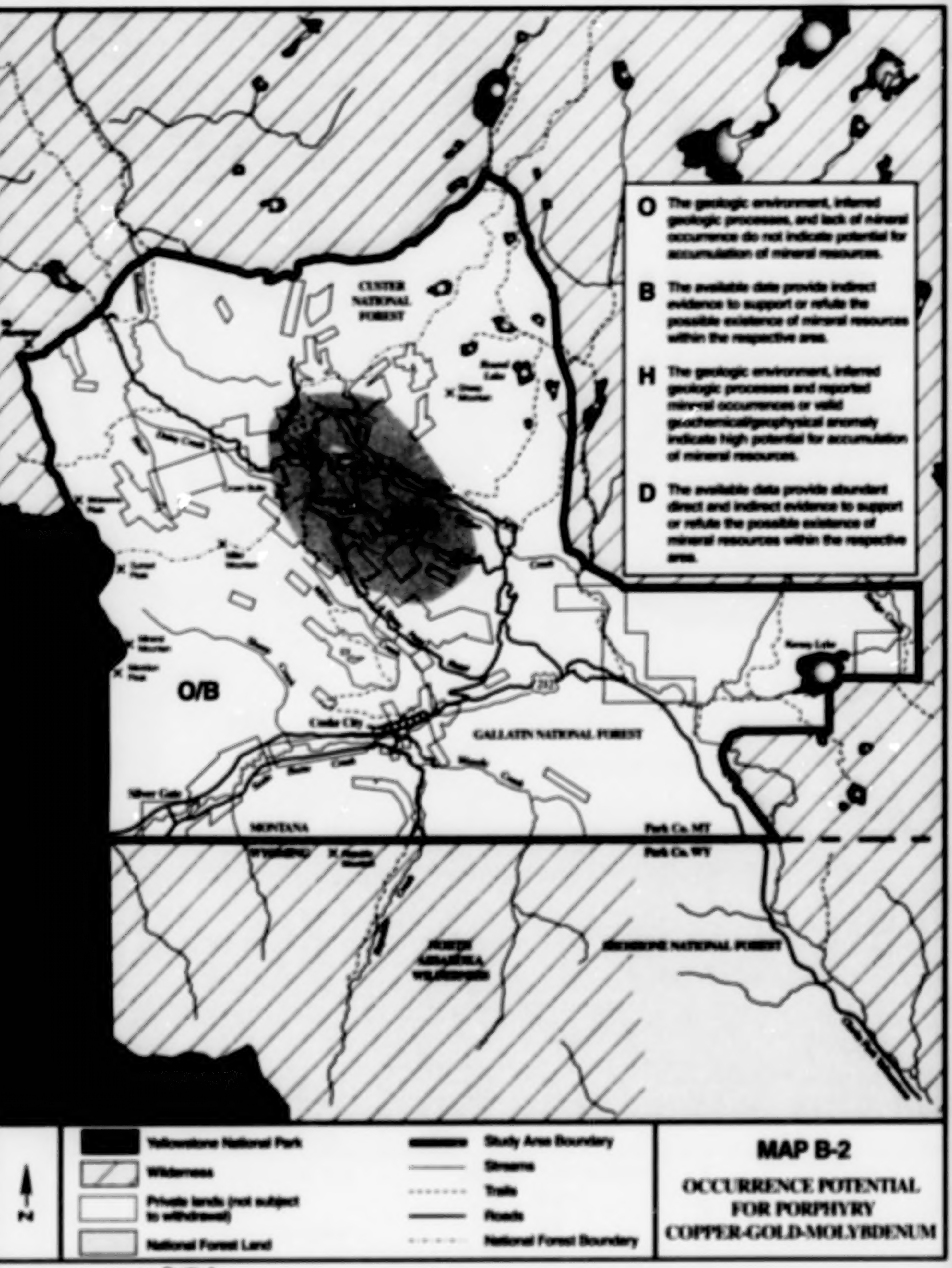


O The geologic environment, inferred geologic processes, and lack of mineral occurrence do not indicate potential for accumulation of mineral resources.

B The available data provide indirect evidence to support or refute the possible existence of mineral resources within the respective area.

H The geologic environment, inferred geologic processes and reported mineral occurrences or valid geochemical/geophysical anomaly indicate high potential for accumulation of mineral resources.

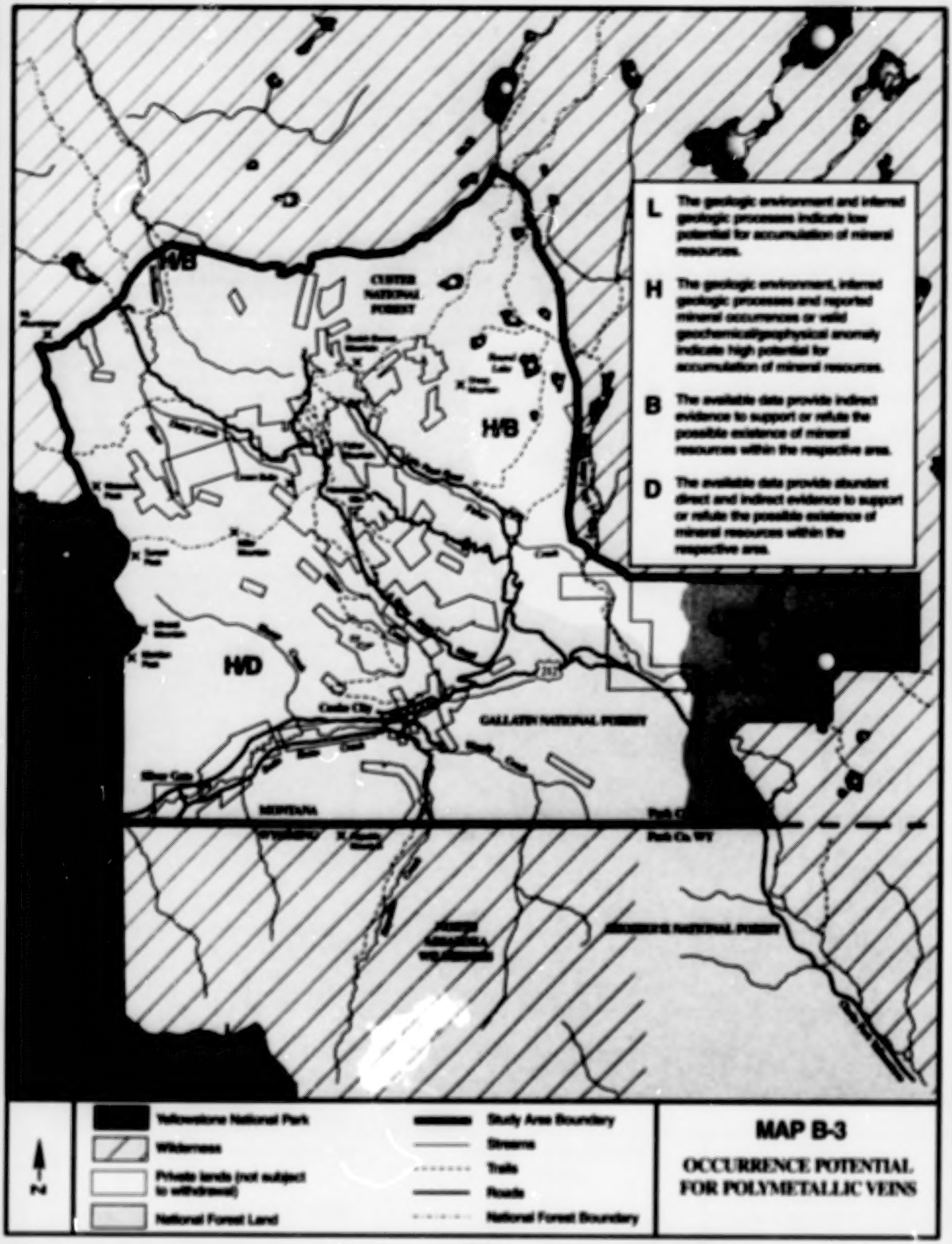
D The available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral resources within the respective area.

N

■	Yellowstone National Park
▨	Wilderness
☐	Private lands (not subject to withdrawal)
☐	National Forest Land
━━━	Study Area Boundary
──	Streams
------	Trails
──	Roads
-·-·-	National Forest Boundary

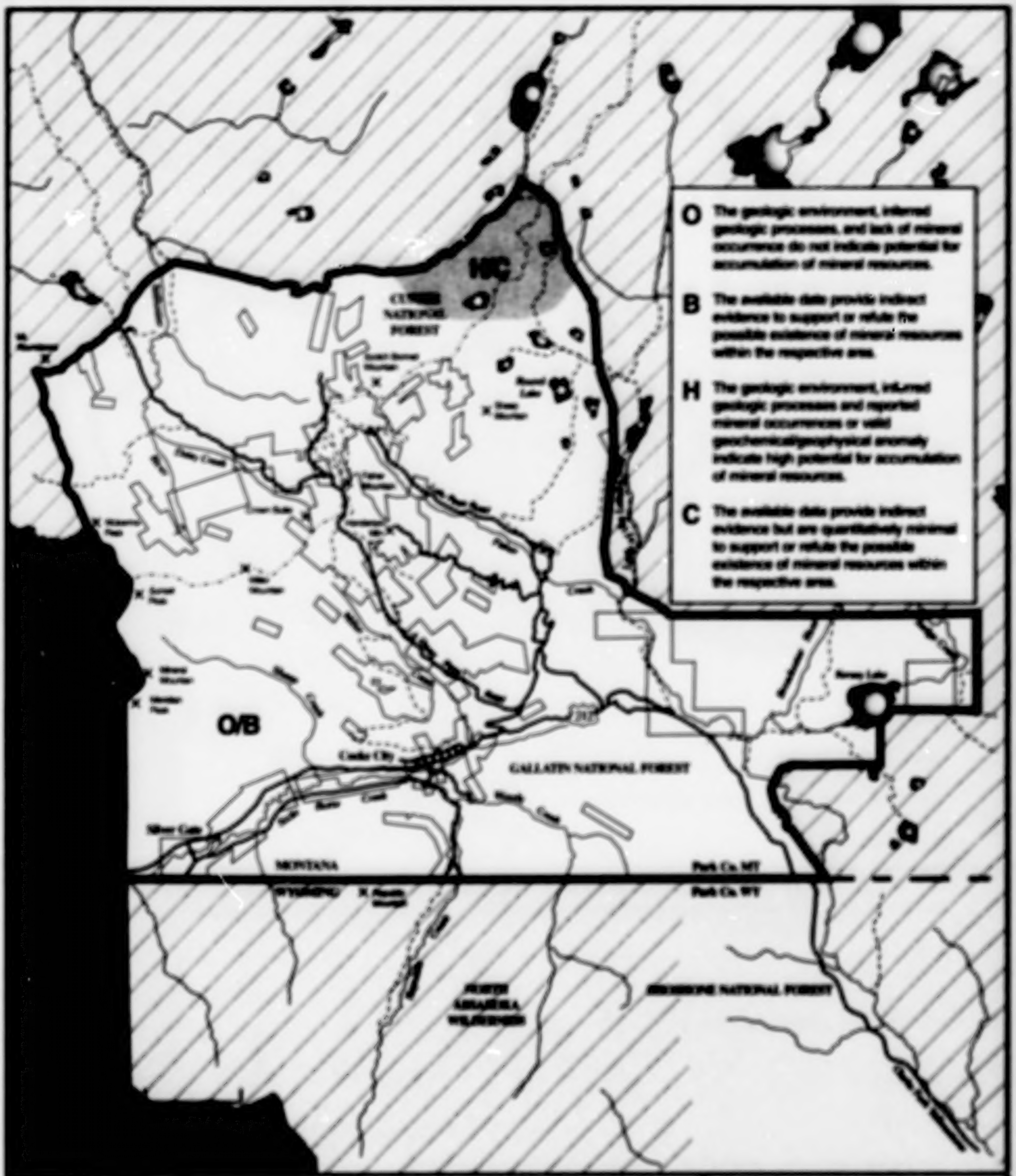
MAP B-2

OCCURRENCE POTENTIAL FOR PORPHYRY COPPER-GOLD-MOLYBDENUM


H/B
CUSTER NATIONAL FOREST
H/B
H/D
212
Cooke City
GALLATIN NATIONAL FOREST
Silver Gate
MONTANA
WYOMING
Park Co. WY
SHOSHONE NATIONAL FOREST
L
The geologic environment and inferred geologic processes indicate low potential for accumulation of mineral resources.
H
The geologic environment, inferred geologic processes and reported mineral occurrences or valid geochemical/geophysical anomaly indicate high potential for accumulation of mineral resources.
B
The available data provide indirect evidence to support or refute the possible existence of mineral resources within the respective area.
D
The available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral resources within the respective area.
N
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary

MAP B-3

OCCURRENCE POTENTIAL FOR POLYMETALLIC VEINS



O The geologic environment, inferred geologic processes, and lack of mineral occurrences do not indicate potential for accumulation of mineral resources.

B The available data provide indirect evidence to support or refute the possible existence of mineral resources within the respective area.

H The geologic environment, inferred geologic processes and reported mineral occurrences or valid geochemical/geophysical anomaly indicate high potential for accumulation of mineral resources.

C The available data provide indirect evidence but are quantitatively minimal to support or refute the possible existence of mineral resources within the respective area.

■ Yellowstone National Park	Study Area Boundary
▨ Wilderness	Streams
☐ Private lands (not subject to withdrawal)	Trails
☐ National Forest Land	Roads
	National Forest Boundary

MAP B-4

OCCURRENCE POTENTIAL ALKALINE GABBRO-SYENITE HOSTED COPPER-GOLD-SILVER-PGE DEPOSITS

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APPENDIX C
SUMMARY OF ASSUMPTIONS

The following assumptions were used in addition to the mineral development forecast contained in Appendix B and summarized in Table 2-2 as a basis for predicting environmental consequences of each alternative and development scenario.

Mineral Development Forecast

Mining: Mining related actions would include: **Prospecting, Exploration** (access, drilling, geophysical exploration, trenching, pits, underground exploration, bulk sampling), **Development** (drilling, develop shafts and adits, access, power, communications, mine and mill site preparation), **Production** (underground and surface methods, ore dressing, wastes, roads), and **Reclamation**. (See USDA Forest Service General Technical Report INT-35 for a discussion of these actions.)

Maps 2-1, 2-2, 2-3, and 2-4 show where mining activities are most likely to occur for each scenario. It was assumed that little or no mining related activities would occur in the low or moderate development potential areas except for mill sites and work camps.

Development of the New World Project is assumed to be reasonably foreseeable. Development of other mines is more speculative. No mining is assumed with Scenario B-2.

Mine reclamation activities for Scenario A-1 and Scenario B-1 would include plugging or treating water from Glengarry adit and Gold Dust adit.

Mine reclamation activities for Scenario A-2 and Scenario B-2 would include reclaiming McLaren and Como pits, plugging or treating water from Glengarry adit and Gold Dust adit, abandoning and reshaping road beds, reclaiming abandoned mine exploration, and reclaiming old tailing piles in Fisher Creek.

Powerline Construction: A 69 kV powerline from Cody to a new substation near Cooke City would be constructed when the first mine is developed. The route would generally follow the existing 14.4/24.9 kV distribution line that runs from Cody to Cooke City. A 24.9 kV segment would probably be built from the substation to each mill site.

Highway 212 and Highway 296: Highway 212 would be plowed to remove snow and to allow trucking supplies and busing employees between Cooke City and Cody year round. The mine(s) would pay for plowing the road to guarantee year round access. Mining related operations would result in daily truck traffic on Highway 296 and 212. Tailings may be hauled to a location(s) in MT or WY. There would be a significant increase in truck traffic on area highways.

Employee Residency: The majority of employees would establish residency in surrounding communities (e.g., Cody, Powell, Gardiner, Livingston, others). Most employees would be bused to the mine sites and work camps from their community of residence for their one to three week work shift. Some additional housing construction would be anticipated in Cooke City and Silver Gate.

Other Reasonably Foreseeable Activities

Highway Construction: Within a 20-year period, the highway between Mammoth and Cooke City as well as the highway between Cooke City and Cody would be upgraded. The construction periods would occur between April and November. At least one sand and gravel pit is expected to be developed within the study area.

Recreation Use and Trends: Recreation use in Yellowstone National Park and surrounding areas would continue to increase. Mining would cause some recreation use to be displaced.

Water Rights: Surface water and groundwater rights within Soda Butte Creek Drainage appear to be fully appropriated. Additional development within that drainage will be limited unless water rights are purchased from an existing user or diverted from another drainage.

Residential Development: Demand for private land within the study area has been increasing. Three or four homes/cabins have been built per year. This also results in an increased demand for access to inholdings. This trend is anticipated to continue in the future.

APPENDIX D
LANDSCAPES, SOILS, AND VEGETATION

Landscapes

Landscapes are combinations of the earth's features that are important to potential uses. They affect the kinds of ecosystems present in the area, and their response to various management scenarios. Landscapes in the Withdrawal Area (Map D-1) range from barren, high peaks and tundra-covered plateaus to rolling forested slopes. Elevation ranges from 7400 feet to above 10,000 feet, and includes some of the highest and coldest lands in the Greater Yellowstone Area, as well as moderately productive forest lands similar to many commercial timber lands in the Gallatin National Forest. The northern one-half of the area has an alpine look, with the southern one-half primarily in a forested environment. A description of those landscapes is summarized in Table D-1.

Soils

Soils in the study area range from very sandy to moderately clayey. Most have either a glacial or alluvial origin, and are relatively young (less than 8,000 years old). They have weakly expressed horizons (layers). Soil distribution is shown in Map D-2. The northern one-third of the area is characterized by coarse textured, rocky soils with low potential productivity and high erodibility. They have light-colored surface layers, and may be shallow to bedrock. They make up 14,088 acres, or 54% of the study area.

Medium textured soils occur in the eastern Stillwater River drainage and near Wolverine Mountain. They have formed in glacial till derived from extrusive volcanic rocks. These soils have high potential productivity but are highly susceptible to compaction and smearing when wet. They make up 2,247 acres or 9% of the study area.

Soils in the lower one-third of the area and along Abundance Creek have high clay content and are potential sediment sources. They make up 7,094 acres or 27% of the study area.

Wet soils with a variety of textures occur near streams and around Kersey Lake. They, with interspersed drier soils, make up 2,395 acres or 9% of the study area.

Soils in the central portion of study area have been affected by past mining activities. Acid-producing rock materials have been exposed at the surface, producing highly acid soils with little productive capacity. Soil pH can be as low as 2.5 in these areas. A somewhat larger surrounding area, primarily near Henderson Mountain, contains soils that naturally contain these acid-producing rocks. Here soil pH can be as low as 3.4. These areas have low plant productivity. Most of the remainder of the study area contains soils with normal properties, due to natural soil buffering of acids, absence of acid-producing rocks, or weathering processes. They are moderately productive at lower elevations, and generally have low productivity in the remainder of the area.

Vegetation

Vegetation ranges from high alpine turf and tundra to moderately productive forest, though most of the area is dominated by turfs and scattered, high elevation forest. Distribution is shown in the Map D-3.

Alpine turf occurs at the highest elevations. It is characterized by low growing grasses and forbs with very low productivity. Results of disturbance can easily be visible for 50 to 100 years. This vegetation type makes up 5,764 acres or 22% of the study area.

Upper subalpine forest occurs throughout the area at elevations above 8,000 feet. Common plant species are whitebark pine, sub-alpine fir, lodgepole pine, and grouse whortleberry. Productivity is low and reforestation potential is low. These are generally non-commercial areas, with the exception of some stands east of Cooke City. This vegetation type makes up 9,098 acres or 35% of the study area.

Lower subalpine forest occurs in the eastern portions of the study area on the slopes above Cooke City and north of Kersey Lake. Common species are sub-alpine fir, lodgepole pine, and grouse whortleberry. Productivity is moderate and reforestation potential is high. This vegetation type makes up 2,834 acres or 11% of the study area.

Meadows and sparse upper subalpine forest occur on steep slopes interspersed with non-vegetated rock rubble. Common plants are meadow forbs and grasses, whitebark pine, and sub-alpine fir. Productivity is very low, and reforestation potential is low. Results of disturbance can easily be visible for 50 to 100 years. This vegetation type makes up 8,884 acres or 25% of the study area.

Riparian and forest vegetation occurs near stream courses and in alluvial basins.

Willows, sedges, and grasses are interspersed with spruce, lodgepole pine, and sub-alpine fir. Productivity is high to moderate and revegetation potential is high. This vegetation type makes up 2,395 or 9% of the study area.

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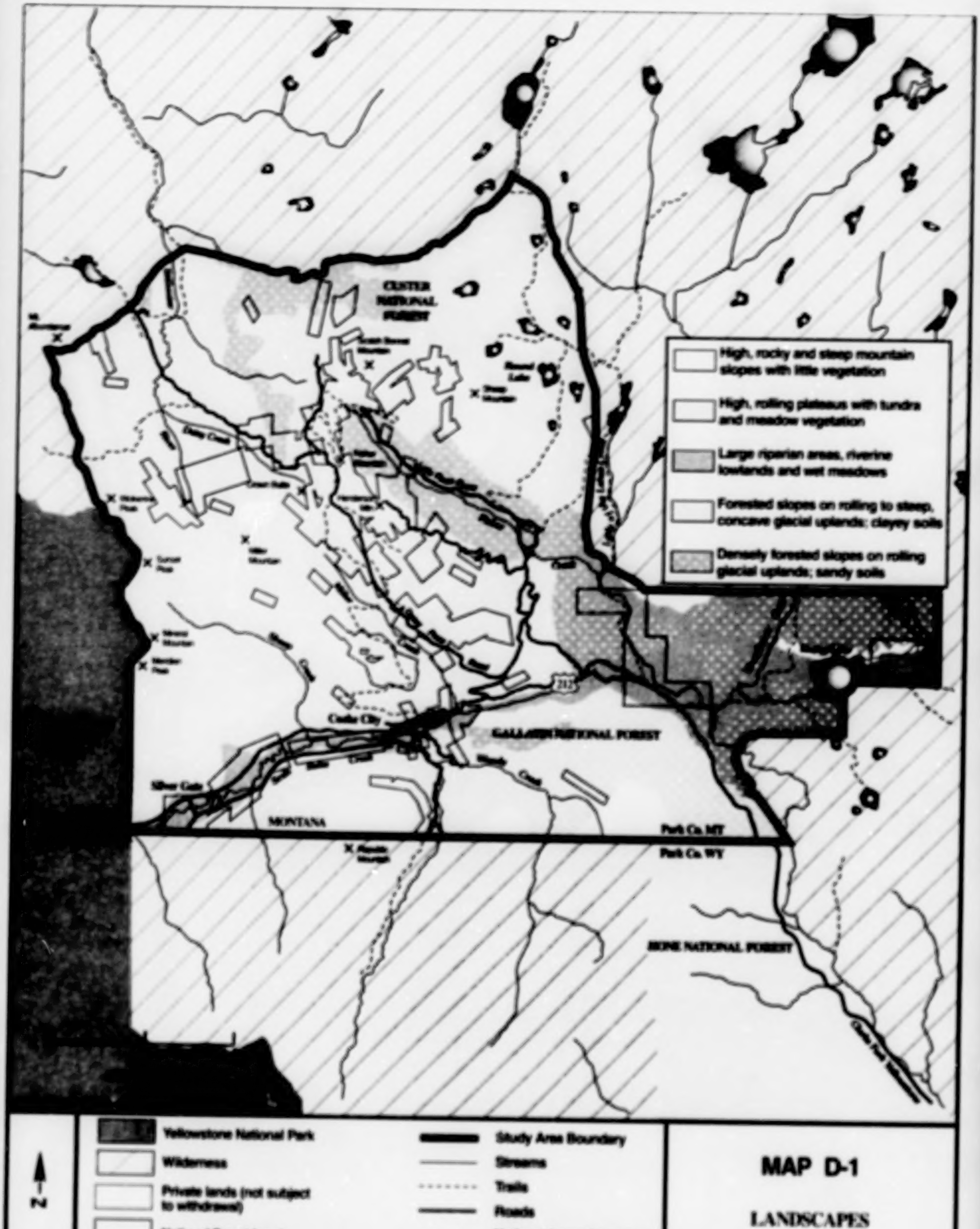
TABLE D-1 LANDSCAPES DESCRIPTIONS IN THE STUDY AREA

High, rocky and steep mountain slopes with little vegetation	8,200 to 10,500 feet	5,732 acres or 22%	Middle of the study area, forming a spine of peaks along the Gallatin National Forest boundary.	Steep, relatively concave slopes, including glacial troughwalls and headslopes.	Shallow, very coarse to medium textured, with many rock fragments intermixed with bedrock outcrops and talus.	Timberline forest and meadows.	Hard metamorphic rocks throughout most of the area, volcanic rocks in the west, and limestone with sandstone near the McLaren pit and Henderson Mountain.
High, rolling, plateaus with tundra and meadow vegetation	8,600 to 9,800 feet	5,764 acres or 22%	Mid to northern portion of the study area.	Rolling plateaus and broad glacial cirque bottoms.	Shallow, very coarse to medium textured, with many rock fragments intermixed.	Meadows, tundra, sparse timberline forest.	Primarily hard, metamorphic rocks with some extrusive volcanic rocks.
Large riparian areas: riverine lowlands and wet meadows	7,400 to 9,800 feet	2,395 acres or 9%	Scattered throughout the area, primarily along major river or stream corridors and on high plateaus in the northern part of the study area.	Valley stream bottoms and alluvial basins.	A mixture of wet, silty soils and dry, moderately coarse to medium textured soils.	A mixture of riparian vegetation, sedge, willow, subalpine fir and lodgepole pine.	Mixture of rocks.
Forested slopes on rolling to steep, concave glacial uplands; clayey soils	7,400 to 8,000 feet	7,879 acres or 30%	Primarily in the southern two-thirds of the study area.	Glacial trough bottoms and sideslopes.	Moderately fine to medium textured, with many rock fragments.	Dense lower to upper subalpine forest, intermixed with meadows.	Sandstone and shale; extrusive volcanic rocks.
Densely forested slopes on rolling glacial uplands; sandy soils	7,800 to 9,700 feet	4,053 acres or 16%	Eastern one-third of the study area.	Rolling glacial uplands with some steeper glacial trough mid-slopes.	Moderately coarse textured, with many rock fragments.	Dense to sparse forest intermixed with meadows.	Hard metamorphic rocks and granite.

Water makes up about 117 acres or 1% of the area (Kersey Lake).


CUSTER NATIONAL FOREST
Round Lake
Cooke City
Silver Gate
GALLATIN NATIONAL FOREST
MONTANA
Park Co. MT
Park Co. WY
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High, rocky and steep mountain slopes with little vegetation
High, rolling plateaus with tundra and meadow vegetation
Large riparian areas, riverine lowlands and wet meadows
Forested slopes on rolling to steep, concave glacial uplands; clayey soils
Densely forested slopes on rolling glacial uplands; sandy soils
Yellowstone National Park
Wilderness
Private lands (not subject to withdrawal)
National Forest Land
Study Area Boundary
Streams
Trails
Roads
National Forest Boundary
N

MAP D-1

LANDSCAPES

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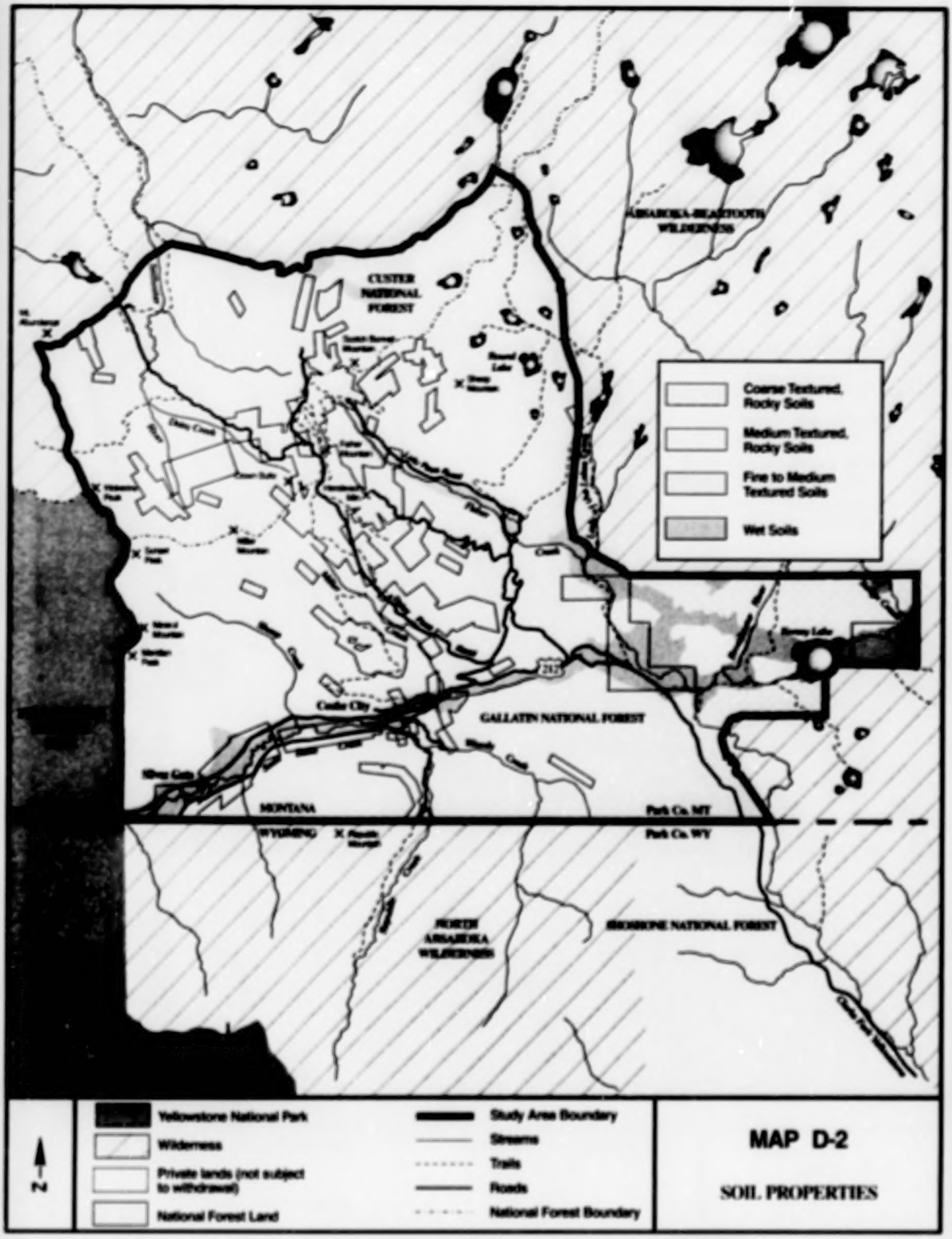

MAP D-2

SOIL PROPERTIES

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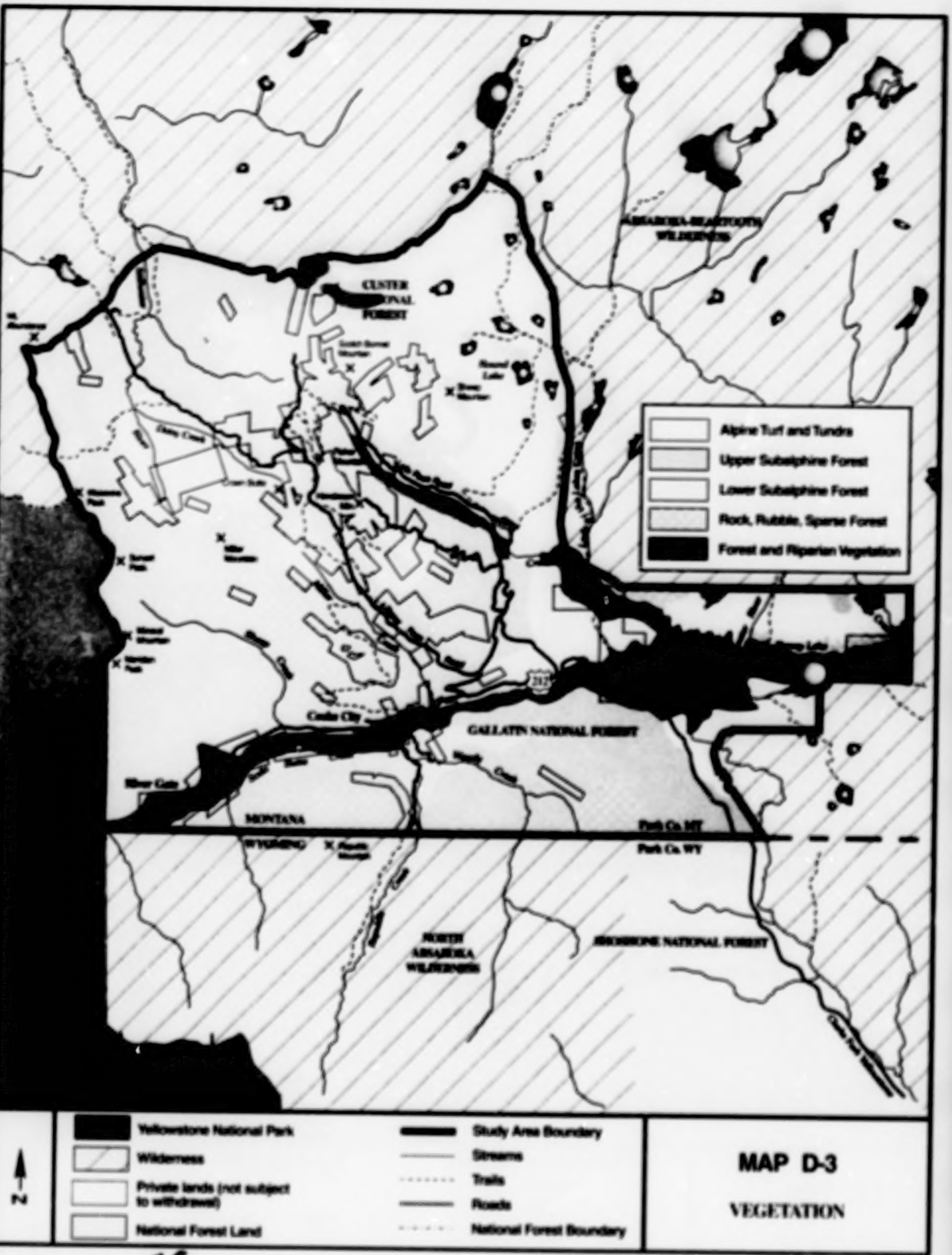

MAP D-3

VEGETATION

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APPENDIX E
BIOLOGICAL ASSESSMENT
(Federally Threatened and Endangered Species)

Prepared by: Don Sasse, Wildlife Biologist, USFS

INTRODUCTION

Project

An environmental impact statement has been prepared which describes and evaluates the management alternatives for the proposed Cooke City Area Mineral Withdrawal. The study area is located within Park County, Montana on the Gallatin and Custer National Forests.

The purpose of this biological assessment (BA) is to review the possible effects of the preferred alternative on Federally listed endangered or threatened species and their habitats in order to determine whether or not a "likely to adversely affect" situation exists. If the preferred alternative affects threatened or endangered species other than those described here, or if new information becomes available that would change the effects analysis, a new or revised BA will be needed. The DEIS preferred alternative is Alternative B, Mineral Withdrawal.

Coordination with the USFWS

In accordance with Section 7 of the Endangered Species Act, a request was made to the U. S. Fish and Wildlife Service (USFWS) for a list of federally-listed threatened, endangered and candidate species that should be considered in the Biological Assessment for the proposed Cooke City Area Mineral Withdrawal (Thompson and Timchak September 4, 1996a; Thompson and Timchak September 4, 1996b). The USFWS responded for Montana (McMaster, September 16, 1996) and the Wyoming Field Office concurred with the list supplied by the Montana Field office of the USFWS (Davis, October 30, 1996). The BLM/USFS (Thompson and Timchak, May 12, 1997) requested USFWS concurrence on Determination of Effects for the FEIS preferred alternative. The USFWS concurred with the FEIS determination (May 23, 1997). It was determined that the grizzly bear (resident), gray wolf (resident, transient), bald eagle (resident, transient), and peregrine falcon (resident migrant) were the threatened and endangered species that may be present in the study area (Table E-1). No proposed species (see discussion below on the status of the gray wolf) or category 1 candidate species were included. No critical habitat has been designated or proposed in the study area.

New direction was provided regarding the gray wolf. On November 22, 1994, the USFWS published final rules in the *Federal Register* designating wolves reintroduced in Yellowstone National Park as nonessential experimental populations. Wolves designated as nonessential experimental, that are not within units of the National Park or National Wildlife Refuge systems, are treated as proposed species for Section 7 purposes.

TABLE E-1. FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES PRESENT[1]

[illegible]	[illegible]	[illegible]	[illegible]
Grizzly bear	Ursus arctos horribilis	Threatened	Resident
Gray wolf	Canis lupus	Nonessential Experimental[2]	Resident, transient
Bald eagle	Haliaeetus leucocephalus	Threatened	Resident migrant
Peregrine falcon	Falco peregrinus	Endangered	Resident, migrant

[1] Identified in coordination with the USFWS (McMaster, September 16, 1996).

[2] New direction was provided regarding the gray wolf. On November 22, 1994, the USFWS published final rules in the *Federal Register* designating wolves reintroduced in Yellowstone National Park as nonessential experimental populations. Wolves designated as nonessential experimental that are not within units of the National Park or National Wildlife Refuge systems are treated as proposed species for Section 7 purposes.

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AFFECTED ENVIRONMENT

This section describes the rational for probability of occurrence.

Grizzly Bear (Threatened) - Greater Yellowstone Area (GYA)

Overview

A self-perpetuating grizzly bear population exists within the Greater Yellowstone Area. Because the grizzly bear is a threatened species, the USFWS has prepared and implemented a recovery plan for the grizzly bear. The future of the Yellowstone grizzly bear is uncertain and controversial. Trend data indicates that the grizzly bear population is increasing following a decline caused by the closure of open garbage dumps in 1970 and 1971, in concert with other factors. It is difficult, however, to determine actual population numbers. One recent estimate of grizzly bear population trends is contained in Eberhardt and Knight, 1996.

As part of the USFWS's recovery plan, parameters were established to facilitate recovery. Although the 1993 Recovery Plan is in litigation and pending settlement, the Plan's parameters provide a means to measure changes in the grizzly bear population over time and determine recovery ability of the population. Meeting the goals established for these parameters would lead towards population recovery. The recovery goal for allowable, known human-caused mortality is not-to-exceed 4 percent of the estimated population, with female mortality not-to-exceed 30 percent of the 4 percent. The population estimate is recalculated annually, therefore fixed numbers were not used here.

The majority of grizzly bear mortalities since 1974 are attributable to human-related incidents, such as shootings and management control actions. Almost half of the mortality risk is associated with people carrying firearms on National Forests. Known and probable grizzly bear deaths tend to be centered around specific areas in and around Yellowstone National Park (NP), such as gateway communities of West Yellowstone, Cooke City, and Gardiner, as well as certain recreational developments, sheep grazing allotments, and other human concentration areas. High mortalities in 1994 and 1995 were in contrast to the declining trend of the previous 10 years.

Study Area - Grizzly Bear Management Unit

The study area is within Management Situation 1 (USFS, September 1984, P. 4), grizzly bear habitat and is adjacent to Yellowstone NP and the Absaroka Beartooth and North Absaroka Wilderness areas. The area around Cooke City townsite is considered to be Management Situation 2. The Management Situation 1 grizzly bear habitat within the study area is under utilized by grizzly bears because of the present levels of human activity and past levels of bear mortality. The Cooke City area is considered to be a population sink for the grizzly bear (Knight, et al. 1988, P. 121), but the remainder of the study area is not. The cumulative effects boundary for grizzly bear for this analysis is Lamar Subunit #1 and #2, and Crandall/Sunlight Subunit #1, #2 and #3, Grizzly Bear Management Unit (BMU) which includes the study area (Tyers, August 21, 1996; Figure 24) and a portion of Yellowstone National Park.

Mortality/Habituation. The number of human-caused grizzly bear mortalities is positively correlated both spatially and temporally with increased human access and activity, and the resulting increased contact between bears and humans.

Habituated or food-conditioned grizzly bears are much more likely to be killed by humans than bears that remain wary, especially where human activity is relatively unregulated and/or big game hunting is allowed. Habituated bears are proportionately most active and most common near human facilities such as roads, viewing areas, and recreational developments, especially in unhunted populations. Habituated bears are often perceived to be a threat to human safety; consequently, they are typically killed at a higher rate than wary bears. Thus, habituation typically increases mortality risk for individual bears except where human activity is closely regulated and the bear population is unhunted. Ungulate hunters accounted for a large portion of defense-of-life-and-property kills in the Yellowstone ecosystem since 1988. Most illegal kills occurred during the big-game hunting season.

Denning Habitat. Continent-wide, the grizzly bear shows a strong fidelity to denning areas. Grizzly bears in dens are relatively tolerant to disturbances beyond 1 km. Denning areas represent locations where bears concentrate their activities. Denning habitat is not considered to be a factor limiting grizzly bears in the Yellowstone area. Suitable grizzly bear denning habitat exists on high elevation slopes containing dense conifer cover within and around the study area. These areas include, but are not limited to portions of Republic, Woody, Hayden Creek, Cache, Soda Butte to Lamar Valley, Fisher, and Lady of the Lake Creeks (per. comm, Dan Tyers, USFS, Sept. 10, 1996). Habitat north of Cooke City where logging and fire have removed cover and the road density is high is not suitable for denning (Tyers, D. Jan. 16, 1997). Additional site specific information on denning habitat is contained in Tyers, Aug. 21, 1996.

Hiding and Security. The study area, in contrast with the surrounding area, has a high road density and high levels of human use. In addition, the quality of the hiding and security cover varies throughout the study area because of past fire and timber harvesting events.

The analysis of affects to grizzly bear habitat is, in part, based on an assessment of impacts to potential core areas. Based on current standards, core areas are defined as areas where (1) no motorized use of roads and trails occurs during the non-denning period, and restricted roads require closure devices that are permanent; (2) no roads or trails exist that receive non-motorized, high intensity use as defined in established cumulative effects activity definitions; and (3) a minimum of 0.3 miles (500 m) exists from any open road or motorized trail. Refer to Map 3-17 for the location of potential core areas, open roads, and high use trails in the study area. Standards for core areas and other issues related to human access may change as our understanding of grizzly bear habitat requirements is refined. Core areas have yet to be formally established in the study area.

The extent of core area changes seasonally primarily due to seasonal trail use involving hiking, skiing, snowmobiling, or hunting activities. As recreation use increases, core areas may shrink as a result of the increased human presence. The time of year that core areas are generally the smallest varies with elevation which influences access and the type of recreational activity that may be occurring during that season. The seasons are spring (3/1 through 5/31), summer (6/1 through 8/31), and fall (9/1 through 11/30). The denning season is from 12/1 through 2/29 during which bears are generally not active. During the spring, at the high elevations in the Cooke City area, skiing and snowmobiling are the primary form of recreation. During the summer, hiking is the major recreation use on trails. During the fall, hunting outside the Park influences trail use and hiking continues to influence trail use in the Park.

Seasonal core area changes are primarily due to trails going from low use (less than 20 parties/week) to high use (equal to or more than 20 parties/week) from hiking, skiing or hunting activities (Tyers, Aug. 21, 1996, Figure 10). Use in Crandall/Sunlight #1 is highest in the summer and lowest in the spring due to the increase in hiking activity that occurs in this area in the summer. Use in the Crandall/Sunlight #2 and #3 appears to be fairly consistent throughout the year with a fairly small change in core through the seasons. Core area in the Lamar #1 subunit is smallest in the summer because the highest use of trails is by summer hikers. A small decrease in core area occurs in Lamar #2 in the summer. The Lamar #2 subunit is the most isolated and receives the least human use of the five subunits being considered in this analysis.

Food/Prey Base of the Grizzly Bear. Grizzly bears are opportunistic feeders that use a wide variety of animal and plant food items. Although diet varied as much by season as by month, trends are discernible. The main items in the diet of Yellowstone grizzly bears are whitebark pine nuts, graminoids, and ungulates. Ungulate meat is estimated to be one of the top two sources of energy in the average diet. Carrion scavenged from March through May can constitute a major portion of this ingested meat.

The whitebark pine component of forests has limited distribution in Montana and is in a declining trend due to stand maturity, susceptibility to pests and the presence of non-native pathogens such as white pine blister rust. Whitebark pine is generally less common and provides better forage habitat for grizzly bear and other wildlife than other forest types in the study areas. The 26,160 acre study area contains approximately 2,340 acres of mature and 50 acres of non-mature whitebark pine forest. Whitebark pine forests within the study area are located at high elevations including areas within high elevation mining claims (e.g., Henderson Mountain area). Relatively few acres of whitebark pine burned in the 1988 fires.

Whitebark pine seeds are an important food of grizzly bears and the use of this food by bears is positively associated with fecundity and survival of the population. Use of pine seeds by grizzlies is almost entirely contingent upon the presence and behavior of red squirrels. During most years, virtually all (97%) pine seeds used by grizzly bears is a result of excavations in middens for the otherwise indehiscent cones cached there by squirrels.

Ungulates are especially important in the diet during March, April, May, September, and October. Diets of grizzlies in the northern mountains and valleys immediately west of the study area are characterized by large volumes of pine nuts and ungulates and relatively low volumes of graminoids than in other regions of the Yellowstone area.

Primary animal food sources (ungulates and rodents) are elk, bison, moose, pocket gophers, and voles. Use of these foods helps explain patterns of grizzly bear distribution and cover type selection. Ungulates are an important food source for grizzlies that potentially range in and around the study area.

Ungulates are used when they are most available and vulnerable, such as winter kill or weakened animals during the spring, calves during May and June, or weakened bulls during the fall rut. A few grizzlies have learned to kill adult elk during the summer. Long-term trends in bear food habits in the Yellowstone area have been influenced by climatic fluctuations and changes in management of fish and ungulate populations.

Grizzly bear use of the ungulate prey base in the Yellowstone area may change now that wolves have been reintroduced. Currently, grizzlies have almost exclusive use of bison carcasses because their hides are too tough for other scavengers to penetrate. Presumably, wolves will be able to open bison carcasses, and thus could compete with grizzly bears for winter-killed bison. Determining the impacts of wolves on grizzly bear prey base is difficult, because, at this point, the number of wolves that the Yellowstone area can support, their distribution, and their effects on the prey base are conjectural. The changes in ungulate habitat are discussed under each species later in this analysis.

Snow Plowing. Portions of U.S. 212 and WY 296 pass through moose, elk, and mule deer winter ranges. Vehicle collisions with big game animals is typically minimal during the winter months because snow is not plowed from the highways and motor vehicle use is limited to snowmobiles. Snow conditions on unplowed segments of secondary roads typically limit large ungulate access to higher elevations in the study area during the winter. Vehicle collisions with game animals along unplowed roads result in minimal big game carrion sources and minimal attractants to grizzly bears.

Gray Wolf (Nonessential Experimental Population)

Historically the former range of the Northern Rocky Mountain subspecies of the gray wolf extended from Canada into the northern two-thirds of Wyoming. In the early days of Yellowstone NP, there was a government-sponsored program to eliminate wolves. Nationally the interest was to preserve livestock, but locally this was done in deference to ungulates. In recent years, gray wolves have been reported in the Yellowstone NP area, but sustained pack activity in the vicinity has not been documented for years. At this time there is no ongoing pack activity in the immediate vicinity of the study area, though wolves may occasionally pass through the study area (pers. comm., Joe Fontane, USFWS, October 28, 1996 and January 22, 1997). As of January 1, 1997, at least three wolf packs reside in the Lamar Valley in Yellowstone NP west of the study area (pers. comm., Mary Hektner, Yellowstone N.P., NPS, Jan. 14, 1997).

The Yellowstone Ecosystem has been designated as a recovery area for the gray wolf. It has been estimated that Yellowstone National Park's northern winter range could support about 75 wolves or about nine packs. The Park could also overlap with the territories of an additional three to four packs. The project area could include portions of one or more territories of these packs.

Recent reintroductions of the gray wolf in Yellowstone National Park raises the potential of possible project effects on wolf populations. According to 50 CFR Part 17 (November 22, 1994), the reintroduced wolves in Yellowstone National Park are classified as a "nonessential experimental" population according to Section 10(j) of the Endangered Species Act (ESA). "Nonessential experimental" animals located outside national wildlife refuges or national park lands are treated for purposes of Section 7 of the Act, as if they were only proposed for listing" (50 CFR Part 17). In other words, although the wolf is an endangered species, it is treated on National Forest lands as if it were proposed for listing. According to 50 CFR Part 17, "there are no conflicts envisioned with any current or anticipated management actions of the Forest Service or other Federal agencies," and management of wolves in the experimental population would not cause major changes to existing private or public land use restrictions. Land use restrictions on public lands could be used, however, to control human intrusion of den sites when fewer than six breeding pairs exist within the experimental area.

Gray wolves are wide-ranging and their distribution is tied primarily to that of their principal prey (elk, bison, moose, etc.). Key compoments of wolf habitat are considered to be: "(1) a sufficient, year-round prey base of ungulates (big game) and alternate prey, (2) suitable and somewhat secluded denning and rendezvous sites, and (3) sufficient space with minimal exposure to humans." Key summering areas for ungulates, especially elk, are considered to be of particular importance in managing for wolf recovery. During winter periods, deer, elk, and moose continue to represent principal prey items for wolves, and wolf distribution is keyed to the winter ranges of these species. In Yellowstone National Park, an established wolf population was predicted to prey on ungulates in the following decreasing order of importance: elk, bison, mule deer, moose, pronghorns, and bighorns. Potential wolf use of the project area would coincide with the presence of ungulates on seasonal ranges. The absence of cattle and domestic sheep grazing in the study area reduces the likelihood of conflicts that could result in wolf mortality and/or hinder their use of the study area.

Bald Eagle (Threatened)

Bald eagles are residents and winter visitors in Yellowstone National Park and the surrounding Yellowstone ecosystem. The Yellowstone ecosystem and the analysis areas lie within the Greater Yellowstone Recovery Zone. Suitable bald eagle nesting habitat might occur within the mineral withdrawal area and powerline analysis areas. Foraging habitat is present, including Lake Abundance. Bald eagles are occasionally seen at the larger lakes during the summer, but there are no known nest sites. Recreational activity at this lake as well as high elevation and late ice-free season renders this site relatively unsuitable as nesting habitat.

Bald eagles may also occasionally wander over the powerline corridor, especially near the Clarks Fork Yellowstone River and in the vicinity of Swamp Lake. Disturbance might occur to bald eagles foraging within the project area and potentially to bald eagle nesting habitat within the powerline corridor. There are currently no ready sources of carrion resulting from ungulates killed on winter range by motor vehicles on highways during the winter months.

Peregrine Falcon (Endangered)

The peregrine's preferred nest site is a rugged, remote cliff (100 to 300 feet in height), usually overlooking water or marshy areas where prey is abundant. Preferred hunting areas include cropland, meadows, river bottoms, marshes, and lakes that attract abundant bird life. Peregrines may travel up to 17 miles from nesting cliffs to hunting areas. Peregrine falcons are considered uncommon in Yellowstone National Park, but nesting has been documented. Recent reintroduction efforts have increased the number of nesting pairs within the Greater Yellowstone Ecosystem. There are abundant suitable cliff nest sites in the project area, but much of the project area is still covered with deep snow during the nesting season and is not considered attractive to nesting peregrines. Dispersing or transient birds may occasionally fly over the study area.

EFFECTS OF IMPLEMENTATION OF THE PREFERRED ALTERNATIVE

The preferred alternative is: Alternative B, Mineral Withdrawal. *Scenario B-1, New World Mine Agreement Not Implemented: Under this Scenario, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development. The Forecast for Mineral Activity (Table 3-2) assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2.3.*

Scenario B-2, New World Mine Agreement Implemented: Under this Scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal. If the NWM Agreement is implemented, an additional 4,180 acres of Crown Butte's unpatented mining claims would also be withdrawn. Sixty acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development (Map 2-4). The mineral forecast, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes no mines would be developed and 1 exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

Mining Related Actions. Mining related actions would include prospecting, exploration (access, drilling, geophysical exploration, trenching, pits, underground geophysical exploration, bulk sampling), development (drilling, development shafts and adits, access, power, communications, mine and mill site preparation), production (underground and surface methods, ore dressing, wastes, roads), and reclamation. See USDA Forest Service General Technical Report INT-35 for a discussion of these actions.

Grizzly Bear (Threatened)

Population Level or Demographic Responses

Conflicts and Mortality. There is a decreased risk of higher mortality rates resulting from conflicts between bears and humans as a result of illegal causes or control actions. Due to the decrease in the risk of grizzly bear mortality from illegal causes, management flexibility will tend to be maintained.

Mortality/Habituation. There is a decreased risk that grizzly bear habituation with humans within the BMU will be lethal to bears. There is a decreased risk of mortality for the population of grizzly bears due to unpredictably dispersed and armed humans.

Denning Habitat. There is a decreased risk that mining related actions may result in direct and indirect impacts to suitable denning habitat in areas currently receiving low levels of human use in the study area. There would be a reduced risk that human activity within denning habitat could cause an increase in bear mortality thus impacting grizzly bear populations. Human caused mortality is considered to be a factor limiting grizzly bear populations.

Hiding and Security. There would be a decreased risk of a decline in grizzly bear hiding and security area. Vegetation clearing for mining related actions is not likely to occur and therefore, would avoid the direct loss of forested habitats. There would be minimal risk of reconstruction or construction of roads thereby avoiding motor vehicle access to previously unroaded areas and the resultant loss of security for grizzly bears. Indirect effects from mining related actions would tend to be avoided.

Motorized Access Route Density. There would be no mining related changes in the miles of open roads and numbers of town-sites or major recreational developments in occupied grizzly bear habitat.

Core Areas. There would be a decreased risk to grizzly bear core areas from mining related actions in and around the study area which could potentially include Lamar Subunit #1 and Crandall/Sunlight Subunit #1 and 2 of the Lamar and Crandall/Sunlight Grizzly Bear Management Unit (Tyers, Aug. 21, 1996, Figure 24). Core areas would likely remain at about current levels with mining related actions limited to exploration for small mining operations. Interim direction on core areas is likely to be met. At this time, the interim direction is to allow no decrease in core area unless allowed through consultation with the USFWS.

Plan Amendment/Core Areas. There is a decreased risk of increases in road densities from mining related actions sufficient to necessitate an Amendment to the Gallatin Forest Plan.

Change in Non-motorized Trail Use/Core Areas. There is a decreased risk of growth in recreation use and the potential human and bear interactions as a result of mine related population increases, especially in core areas. Acceleration of the current increasing trend in human use of trails in grizzly bear core (unroaded) areas due to mining related actions is unlikely. It is estimated that some low use trails may increase to a high use category in approximately the next 10 years as opposed to almost immediate changes with establishment of a major mine. There could be a cumulative reduction in habitat if low use trails within grizzly bear core areas increased to high use trails.

Food/Prey Base. There is a decreased risk that mining related activities could reduce the available food/prey base for grizzly bears. Mining related effects to the whitebark pine component of forest are not anticipated. Increased trail use resulting from population increases associated with a mine would not occur.

Powerline/Prey Base. Construction of the powerline corridor would not be necessary without mine development, therefore there is a greatly reduced risk of displaced ungulates. Shifts in the ungulate prey base resulting from other mining related actions would not occur. The risks of effects on ungulates are further discussed under each section on prey species (moose, elk, mule deer, bison) in the EIS.

Powerline/Hunter Access. There would be a decreased risk of ungulate hunter and grizzly bear interaction and resultant bear mortality. Maintenance of secure, unroaded blocks of habitat is an important consideration in the stability of hunted populations of ungulates. There would be a decreased risk that area activities would afford greater vehicle access into previously inaccessible secure areas and increase hunting pressure.

Increased Hunter Numbers. There is a decreased risk that grizzly bear mortality will increase due to human population growth from mining related actions. Harvest of elk and mule deer in the area has never been high and would not be expected to change appreciably.

Snowplowing. There would likely be no snowplowing of previously unplowed segments of U.S. 212 and WY 296 for mining related actions and therefore, no associated change from existing levels of vehicle/big game collisions on winter range for moose, elk, and mule deer.

Yellowstone National Park. Snowplowing of the highway for mining related actions would not occur, therefore there would be no increased risk of human access into the park during the winter by mining related populations. There would be no resulting risk to bears who would be in their dens hibernating. There would be a decreased risk of elevated human caused mortality and of the cumulative effects area becoming a population sink to the grizzly bear.

Conclusion. Alternative B, assuming the NWM Agreement is implemented, would result in no major mines and minimal to no direct impacts to the grizzly bear habitat, identified prey items (animals or plants) or their habitat as a result of mining related actions. There would be a general avoidance of indirect impacts of mining related actions such as human activity and related disturbance and potentially increased human caused mortality. Indirect impacts are estimated to have minor to no impacts to available grizzly bear food sources. Abandoned mine reclamation activities could result in minor long-term benefits to grizzly bear habitat where vegetation is re-established and moderate in areas where currently high motor vehicle access is reduced. Reclamation activities could also result in local, temporary human disturbance.

Cumulative Effects. The cumulative effects boundary for grizzly bear was previously identified as Lamar Subunit #1 and #2, and Crandall/Sunlight Subunit #1, #2 and #3, Grizzly Bear Management Unit (BMU) which includes the study area (Tyers, Aug. 21, 1996; Figure 24) and a portion of Yellowstone National Park. There would be a decreased risk of adverse direct and indirect affects on the grizzly bear and its habitat. Mining related actions are not likely to affect occupied or unoccupied grizzly bear denning habitat; hiding and security cover; core areas; prey base; whitebark pine; and the portion of the BMU within Yellowstone National Park. There would be a decreased risk that past, present, and reasonably foreseeable future actions would result in the creation of a population sink to the grizzly bear and increased human caused mortality. There is an increased probability for compliance with the standards in Gallatin Forest Plan Amendment No. 19. Specifically, there is a reasonable probability of at least maintaining the open motorized access route density at or below the current level, maintaining the total motorized access route density at the current level, and maintaining the amount of core areas at the current level. There is insufficient data to determine what if any change would occur to the magnitude of potential competition between grizzly bears and wolves for prey items such as moose from the cumulative affects of past, present, or reasonably foreseeable future actions, including mining related actions.

Gray Wolf

There would be no disturbance from mining related actions within the study area on federal lands nor related powerlines outside of the study area. There would be no plowing of snow associated with mining related actions, therefore large ungulate movement patterns would not be altered. There would be no increase in vehicle collisions and subsequent ungulate carrion sources for predators. Activities associated with saleable minerals (sand, gravel, building stone) could continue within the study area according to the Forest Plans. These activities would tend to occur at existing pits or quarries.

There would be a reduced risk of past, present, and reasonably foreseeable future actions, including mining related actions, impacting gray wolf pack activities, denning habitat, or principal prey species should future pack activity occur in the cumulative effects area. See related discussion on potential prey of gray wolf under the sections on Moose, Elk, Mule deer and Bison in CCAMW EIS.

Bald Eagle

There would be no direct or indirect disturbance to the bald eagle or its potential nesting or foraging habitat from the proposed action (mineral withdrawal). There would be a reduced risk of past, present, and reasonably foreseeable future actions, including mining related actions, impacting the bald eagle or its potential habitat should currently undetected or future use occur in the cumulative effects area.

Peregrine Falcon

There would be no direct or indirect disturbance to the peregrine falcon or its potential nesting or foraging habitat from the proposed action (mineral withdrawal). There would be a reduced risk of past, present, and reasonably foreseeable future actions, including mining related actions, impacting the peregrine falcon or its potential habitat should currently undetected or future use occur in the cumulative effects area.

DETERMINATION OF EFFECT

The determination of effects are based on Alternative B (Mineral Withdrawal Implemented), and discussed in detail below and summarized in Table E-2. The determination of effect apply to either Scenario B-1 (New World Mine Agreement Not Implemented) or Scenario B-2 (New World Mine Agreement Implemented). The dermination of effects was based on the proposed action (mineral withdrawal) and cumulative effects (mine reclamation, increasing recreation use trends, plowing of snow for recreational use, powerline construction for non-mining related actions, etc.).

Grizzly Bear

There would be no effect on the grizzly bear from mineral withdrawal, but the overall determination of the cumulative

TABLE E-2. FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES PRESENT AND DETERMINATION OF EFFECTS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Grizzly bear	Ursus arctos horribilis	Threatened	Resident	NLAE
Gray wolf	Canis lupus	Nonessential Experimental	Resident, transient	NLAE
Bald eagle	Haliaeetus leucocephalus	Threatened	Resident migrant	NLAE
Peregrine falcon	Falco peregrinus	Endangered	Resident, migrant	NLAE

[1]Options in Determination of Effect on Federally listed threatened and endangered species: (1) NE = No Effect; (2) NLAE = Not likely to adversely affect; (3) LTAA* = Likely to adversely affect; and (4) BE = Beneficial effect.
* = Considered a trigger for a significant action.

effect of the alternative is **Not likely to adversely affect**. If there was a net reduction in the density of roads open to motorized vehicles and increase in core area as a result of mine reclamation actions, there is a possibility that a beneficial effect could result. However, given the programmatic nature of this EIS and uncertainty of specific roads, the cause and effect relationship of road closures is uncertain.

Gray Wolf

There would be no effect on the gray wolf from mineral withdrawal, but the overall determination of the cumulative effect of the alternative is **Not likely to adversely affect**. There is no known pack activity in the area at this time, but wolves could utilize the area at some future date.

Bald Eagle

There would be no effect on the bald eagle from mineral withdrawal, but the overall determination of the cumulative effect of the alternative is **Not likely to adversely affect**. There is no known occupied nesting or roosting habitat for bald eagle in the area.

Peregrine Falcon

There would be no effect on the peregrine falcon from mineral withdrawal, but the overall determination of the cumulative effect of the alternative is **Not likely to adversely affect**. There are no known nesting sites or suitable nest habitat for peregrine falcon in the area.

RECOMMENDATIONS FOR REMOVING, AVOIDING, OR COMPENSATING ADVERSE EFFECTS

None identified.

CONSULTATION/COORDINATION

USFWS

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Others

Dan Tyers, District Wildlife Biologist, Gallatin National Forest, Gardiner Ranger District, P.O. Box 5, Gardiner, MT 59030, (406) 848-7485

Clint McCarthy, Forest Wildlife Biologist, Custer National Forest , 2602 First Avenue North, P.O. Box 2556, Billings, MT 59103, (406) 657-6361

Bob Ralphs, Wildlife (Planning, Appeals, Litigation), USFS, Northern Region Regional Office, Federal Building, 200 East Broadway, P.O. Box 7669, Missoula, MT 59807, (406) 329-3640

LITERATURE CITED

Davis, C. P. October 30, 1996. Letter from: Charles P. Davis, Field Supervisor, Wyoming Field Office, USFWS. To: John Thompson, BLM, and Larry Timchak, USFS, Cooke City Area Mineral Withdrawal Team , Billings, MT. Regarding: Reply to request for a list of Federally listed endangered and threatened species. 1 pp.

Eberhardt, L. L., and R. R. Knight, 1996. How many grizzlies in Yellowstone? J. Wildl. Manage. 60(2):416-421.

Fontane, J. October 28, 1996. Phone Record of communication by telephone between Joe Fontane, USFWS, Helena, MT, and Don Sasse, USFS, Custer N. F., regarding gray wolf in proximity to the CCAMW project area. 1 pp.

Knight, R. R., B. M. Blanchard, and L. L. Eberhardt. 1988. Mortality patterns and population sinks for Yellowstone Grizzly Bears, 1973-1985. Wildl. Soc. Bull. 16:121-125.

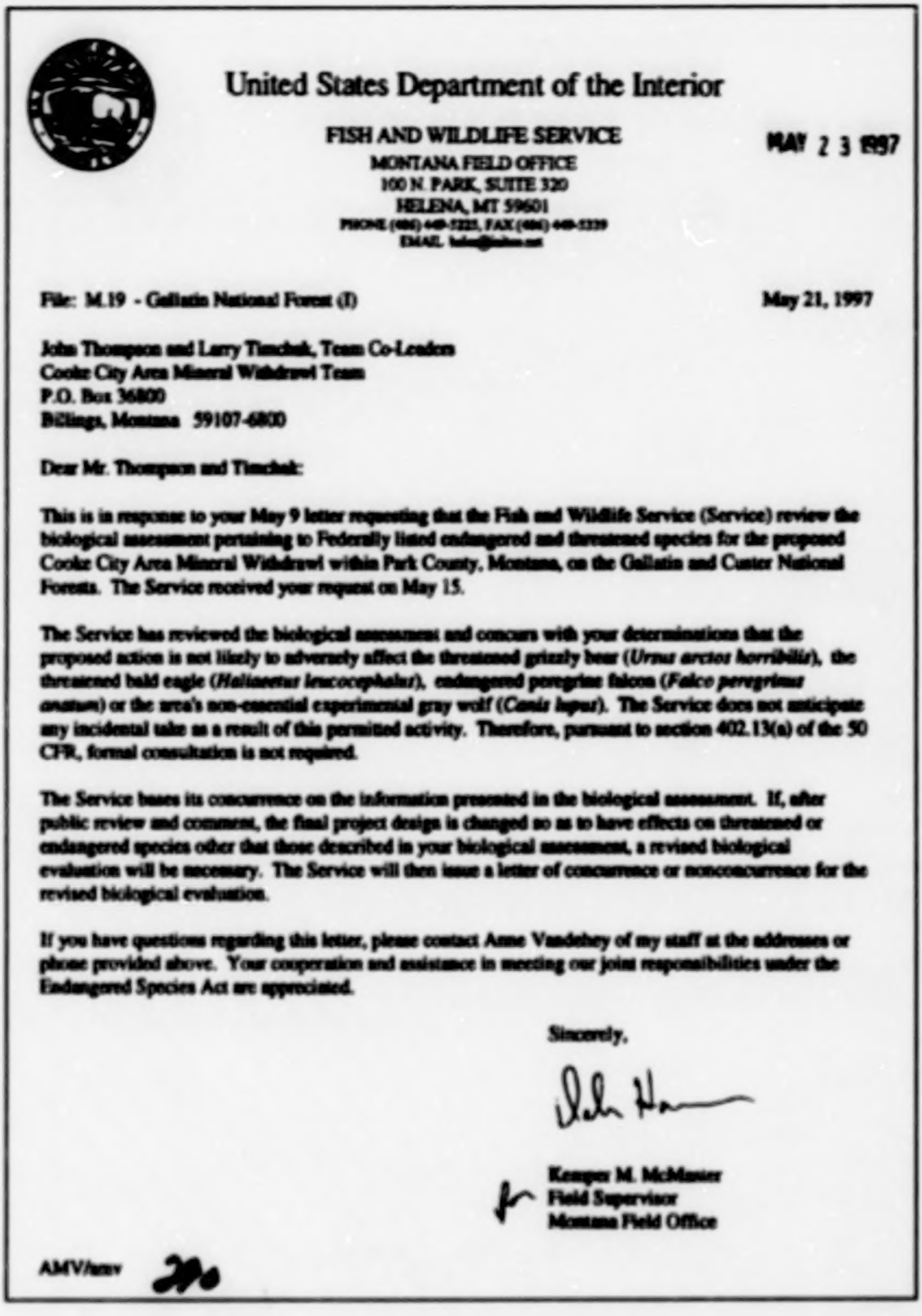
McMaster, K. M. September 16, 1996. Letter from: Kemper M. McMaster, Field Supervisor, Montana Field Office, USFWS. To: John Thompson, BLM, and Larry Timchak, USFS, Cooke City Area Mineral Withdrawal Team , Billings, MT. Regarding: Reply to request for a list of Federally listed endangered and threatened species. 4 pp.

Thompson, J., and L. Timchak. September 4, 1996a. Letter from: John Thompson, BLM, and Larry Timchak, USFS, Cooke City Area Mineral Withdrawal Team , Billings, MT. To: Anne Vandehey, USFWS, Helena, MT. Regarding: Request for Montana list of Federally listed endangered and threatened species. 1 pp.

Thompson, J., and L. Timchak. September 4, 1996b. Letter from: John Thompson, BLM, and Larry Timchak, USFS, Cooke City Area Mineral Withdrawal Team , Billings, MT. To: Mary Jennings, USFWS, Cheyenne, WY. Regarding: Request for Wyoming list of Federally listed endangered and threatened species. 1 pp.

Tyers, D., Aug. 21, 1996. Wildlife Technical Report for the New World Project pre-DEIS. Gardiner Ranger District, Gallatin National Forest, USFS Northern Region, Montana. 174 pp. (8/21/96 draft)

USFS, September 1984. Grizzly bear standards and guidelines for the Gallatin National Forest. _pp.



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MAY 2 3 1997

File: M.19 - Gallatin National Forest (I)

May 21, 1997

John Thompson and Larry Timchak, Team Co-Leaders
Cooke City Area Mineral Withdrawl Team
P.O. Box 36800
Billings, Montana 59107-6800

Dear Mr. Thompson and Timchak:

This is in response to your May 9 letter requesting that the Fish and Wildlife Service (Service) review the biological assessment pertaining to Federally listed endangered and threatened species for the proposed Cooke City Area Mineral Withdrawl within Park County, Montana, on the Gallatin and Custer National Forests. The Service received your request on May 15.

The Service has reviewed the biological assessment and concurs with your determinations that the proposed action is not likely to adversely affect the threatened grizzly bear (*Ursus arctos horribilis*), the threatened bald eagle (*Haliaeetus leucocephalus*), endangered peregrine falcon (*Falco peregrinus anatum*) or the area's non-essential experimental gray wolf ((*Canis lupus*). The Service does not anticipate any incidental take as a result of this permitted activity. Therefore, pursuant to section 402.13(a) of the 50 CFR, formal consultation is not required.

The Service bases its concurrence on the information presented in the biological assessment. If, after public review and comment, the final project design is changed so as to have effects on threatened or endangered species other that those described in your biological assessment, a revised biological evaluation will be necessary. The Service will then issue a letter of concurrence or nonconcurrence for the revised biological evaluation.

If you have questions regarding this letter, please contact Anne Vandehey of my staff at the addresses or phone provided above. Your cooperation and assistance in meeting our joint responsibilities under the Endangered Species Act are appreciated.

Sincerely,

Kemper M. McMaster
Field Supervisor
Montana Field Office

AMV/amv

APPENDIX F
USFS MANAGEMENT INDICATOR SPECIES
(Gallatin and Custer National Forests)

Prepared by: Don Sasse, Wildlife Biologist, USFS

INTRODUCTION

Project

An environmental impact statement has been prepared which describes and evaluates the effects on Management Indicator Species (MIS) as listed in the Forest Plans for the Cooke City Area Minerals withdrawal project area. The project area is located within Park County, Montana and includes portions of the Gallatin and Custer National Forests.

MIS Species Present in the Project Area

The MIS identified for the Gallatin Forest Plan(USFS, 1987, P. II-19) and Custer Forest Plan (USFS 1986, p. 18). were considered in the analysis for the CCAMW EIS and are displayed in this appendix (Table F-1 and F-2) . No further analysis was considered for species absent from the project area. The MIS species present in the project area are further discussed in the EIS.

CONSULTATION/COORDINATION

For the purpose of comparing alternatives in this analysis, MIS species were assumed to be present where suitable habitat was present, but local surveys were incomplete. The following people were contacted in determining MIS present or absent from the project area.

Gallatin National Forest

Dan Tyers, District Wildlife Biologist, Gardiner Ranger District, P.O. Box 5, Gardiner, MT 59030, (406) 848-7375

Marion Cherry, Forest Wildlife Biologist, Gallatin National Forest, 10 East Babcock Ave. P.o. Box 130, Federal Building, Bozeman, MT 59771, (406) 587-6739

Custer National Forest

Clint McCarthy, Forest Wildlife Biologist, Custer National Forest, 2602 First Avenue North, P.O. Box 2556, Billings, MT 59103, (406) 657-6361

Prepared By:

Donald C. Sasse, Wildlife Biologist - LMP, Custer National Forest, 2602 First Avenue North, P.O. Box 2556, Billings, MT 59103, (406) 657-6361

TABLE F-1. MANAGEMENT INDICATOR SPECIES FOR THE GALLATIN NATIONAL FOREST, NORTHERN REGION, MONTANA

Common Name	**Scientific Name**	**USFWS Status**	**General Habitat Requirements**	**Project Areas - Existing Habitat, and Need for Further Analysis**
Grizzly bear	Ursus arctos	Threatened	Threatened species	Yes
Bald eagle	Haliaeetus leucocephalus	Threatened	Threatened species	Yes
Elk	Cervus elaphus		Big game species	Yes
Wild trout			Cold water fisheries	Yes - see Aquatic Resources Report
Goshawk	Accipiter gentilis		Old Growth dependent species, dry Douglas fir sites	Yes
Marten	Martes americana		Old Growth dependent species, moist spruce sites	Yes

[1] Based on Gallatin Forest Plan (USFS 1987, p. II-19). Yes = Considered in analysis. No = No further analysis will be completed.

TABLE F-2. MANAGEMENT INDICATOR SPECIES FOR THE CUSTER NATIONAL FOREST , USFS NORTHERN REGION (R-1), MONTANA[1]

Common Name: Habitat Indicators	**Scientific Name**	**USFWS Status**	**General Habitat Requirements**	**Project Areas Existing Habitat, and Need for Further Analysis**
Goshawk	Accipiter gentilis		Timber - old growth	Yes
White-tailed deer	Odocoileus virginianus		Timber - dog hair ponderosa pine	Yes
Ruffed grouse	Bonasa umbellus		Timber - aspen	Yes
Western kingbird	Tyrannus vociferans		Timber - open savannah [Ashland RD]	No
Lark sparrow	Chondestes grammacus		Timber - open savannah [Sioux RD]	No
Northern oriole	Icterus galbula		Riparian - tree	Yes
Yellow warbler	Dendroica petechia		Riparian - shrub	Yes
Ovenbird	Seiurus aurocapillus		Hardwood draw (grasslands)	No
Rufous-sided towhee	Pipilo erythrophthalmus		Hardwood draw - shrub (grasslands)	No
Brewers sparrow	Chondestes grammacus		Evergreen shrubs: sagebrush	Yes
Sharp-tailed grouse	Tympanuchus phasianellus		Prairie grasslands	No
Prairie chicken	Tympanuchus cupido		Prairie grasslands	No
Cutthroat trout	Oncorhynchus clarki		Aquatic - cold water	Yes, See Aquatic Biology Report
Largemouth bass	Micropterus salmoides		Aquatic - largemouth bass	No, See Aquatic Biology Report
Key (Major Interest)			**Commonly Hunted, Fished, or have Unique Habitat Needs**	
Elk	Cervus elaphus			Yes
Mule deer	Odocoileus hemionus			Yes
White-tailed deer	Odocoileus virginianus			Yes
Bighorn sheep	Ovis canadensis californiana			Yes
Pronghorn antelope	Antilocapara americana			No
Golden eagle	Aquila chrysaetos			Yes
Prairie falcon	Falco mexicanus			Yes
Merlin	Falco columbarius			No
Sharp-tailed grouse	Tympanuchus phasianellus			No
Greater Prairie chicken	Tympanuchus cupido			No
Yellowstone Cutthroat trout	Oncorhynchus clarki bouvieri			Yes, See Aquatic Biology Report

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[1] Based on Custer Forest Plan (USFS 1986, p. 18). Yes = Considered in analysis, No = No further analysis will be completed. Also includes Federally listed threatened and endangered species.

APPENDIX G
MONTANA'S HARD-ROCK MINING IMPACT STATUTES

THE HARD-ROCK MINING IMPACT ACT, THE PROPERTY TAX BASE SHARING ACT, AND THE ALLOCATION OF METAL MINES LICENSE TAX REVENUE TO COUNTIES AND SCHOOL DISTRICTS

SUMMARY

[Updated 4/97]

Montana has enacted three sets of hard-rock mining impact statutes to address the impact needs of local government units and communities affected by the construction, operation and closure of hard-rock mines in the State. Each set of statutes emphasizes a separate phase of the mineral development and a different aspect of its impacts, and each deals with slightly different categories of local government units. While the purpose and scope of the statutes differ, all are concerned in some way with where mineral development employees, students and other mine-related in-migrants reside; where increased needs for local government services and facilities occur; and where and what increased local government costs and revenues result from the mine. In general, the statutes try to ensure the timely availability of mine-related revenues to off-set mine-related costs to local government units. Through the allocation of metal mines license tax revenue to affected counties, the State also attempts to help alleviate the adverse effect a mine's reduction in workforce or closure might have on the economic base of the impact area.

The Hard-Rock Mining Impact Act. Supported as "consensus legislation" by the affected entities, the Hard-Rock Mining Impact Act took effect on May 18, 1981. The HRMI Act provides for the mitigation of local government impacts that result from the construction and operation of new large-scale hard-rock mineral developments in Montana. The purpose of the Act is to enable affected local government units to provide increased local government services and facilities when and where they are needed as a result of new large-scale mineral developments, without burdening existing local taxpayers with the increased costs.

Under the Act, the developer of each proposed new large-scale hard-rock mine must prepare an impact plan that identifies the number of people expected to move into the impact area, the increased need for local government services and facilities, and the increased capital, operating and net operating costs that will result from the new mineral development. In the plan the developer must commit to pay all increased local government capital and net operating costs identified in the plan. Payment may be through property tax prepayments, facility impact bonds, grants or other financing mechanisms that do not shift the increased cost to the local taxpayer. The developer may also commit to nonfinancial assistance. In the plan the local government units must provide for crediting prepaid taxes to the developer during the productive life of the mine, to the extent that tax credits can be made without shifting impact costs over time to the non-developer taxpayer.

Affected local government units work with the developer in preparing the impact plan. Under the HRMI Act, affected local government units may include counties, municipalities, school districts and certain independent special purpose districts. When the plan appears complete, the developer submits it to the Hard-Rock Mining Impact Board and to the affected local government units for formal review by the latter. During the 90-day review period, the most affected county holds a public hearing on the plan for all affected parties. If, during the review period, the governing body of any affected local government unit disagrees with any part of the plan, or finds that something has been omitted from the plan, the governing body may file its objections with the Board. If objections are filed, the review period is followed by a 30-day negotiation period.

When objections cannot be resolved by negotiation between the developer and the governmental units, the Board holds a contested case hearing to adjudicate the dispute. The Board must make its determinations within 60 days following the hearing. The Board then formulates amendments, if any are needed, and approves the plan. If no objections are filed, or if all objections are resolved by the parties before the end of the negotiation phase, the plan is approved automatically.

An approved plan may be amended upon petition to the Board by one or more of the parties under circumstances set forth either in the Impact Act or in the plan itself. Proposed amendments are subject to formal review and objection procedures.

A mineral development is considered to be "large-scale" if, in the construction or operation of the mine and associated milling facility, the developer and contractors at the site will employ more than 75 persons during any consecutive six-month period. As a condition of the statutes under which the Department of Environmental Quality (DEQ) issues the mine's operating permit, a new large-scale mineral developer must have an approved impact plan before commencing activity under its operating permit. If a hard-rock mineral development becomes "large-scale" *after* having received its operating permit, the permittee becomes subject to the requirements of the HRMI Act. The HRMI Board may require the permittee to prepare an impact plan, or the Board may grant a waiver or a conditional waiver to the impact plan requirement.

A large-scale hard-rock mineral developer must comply with the requirements of the Impact and Tax Base Sharing Acts, with commitments in an approved impact plan, and with the terms of a conditional waiver. If the developer fails to comply with these requirements or commitments, the DEQ is required to suspend the developer's operating permit until it attains or resumes compliance.

The statutory requirements for preparing, reviewing, implementing and amending hard-rock mining impact plans are found in the Hard-Rock Mining Impact Act, Title 90, Chapter 6, Part 3 of the *Montana Code Annotated* (MCA). Related provisions are found in Title 90, Chapter 6, Part 4, MCA, and in section 15-37-117, MCA. Sections 82-4-335, MCA, and 82-4-339, MCA, include provisions that pertain to the mine's operating permit, impact plans, and impact plan waivers. Regulatory requirements are contained in the *Administrative Rules of Montana* (ARM), beginning with Section 8.104.101.

The Property Tax Base Sharing Act. In 1983, in addition to amending the Impact Act, the Legislature enacted the companion Property Tax Base Sharing Act. Property tax base sharing is triggered when an impact plan identifies that the increased costs resulting from the mineral development will occur in municipalities, counties or school districts in which the mineral development is not located, or in which an insufficient portion of its taxable valuation will be located. Acting for the Department of Revenue, the "county assessor" implements property tax base sharing by apportioning the post-permit increase in the mine's taxable valuation among affected local government units in each of three categories: counties and municipalities, high school districts, or elementary school districts. Under tax base sharing, each local government unit applies its mill levy to its share of the mineral development's taxable valuation.

Taxable valuation is allocated either according to the statutory formula contained in the Tax Base Sharing Act, based on the place of residence of mineral development employees and mineral development students, or it is allocated as specified in the impact plan. The plan may modify the statutory formula to ensure a reasonable correspondence between the allocation of mineral development taxable valuation and the occurrence of increased costs resulting from the mineral development.

The Property Tax Base Sharing Act is found in Part 4 of Title 90, Chapter 6 of the Montana Code Annotated (MCA).

Metal Mines License Tax Revenue. Metalliferous mines that produce more than $250,000 in gross proceeds, as defined by section 15-23-801, MCA, pay metal mines license taxes to the State of Montana. The tax revenue is distributed as provided by section 15-37-117, MCA. Since 1985, this has included an allocation for the benefit of local government units and communities adversely affected by mine closures or reductions in workforce. Beginning in 1989, sections 15-37-117, 7-6-2225, 7-6-2226, and 20-9-231, MCA, have established a system of allocations to counties and school districts that is designed, primarily, to help mitigate adverse fiscal and economic impacts resulting from a mine closure or a reduction of 50 percent or more in the mineral development's workforce.

Each year the State allocates 25 percent of its metal mines license tax collections to the counties in which the taxpaying mines are located, or to the county or counties identified in an approved impact plan as experiencing, as a result of the mineral development, fiscal and economic impacts resulting in increased employment or increased local government costs. The recipient county must hold at least 40 percent of its revenue in an income producing hard-rock trust reserve account until the workforce reduction or mine closure occurs, at which time the board of county commissioners must allocate at least a third of the money among the affected school districts.

After allocating at least 40 percent of its annual metal mines license tax revenue to the trust reserve account, the board of county commissioners divides the balance, if any, among the county (1/3), the affected high school districts (1/3) and elementary school districts (1/3) within the county. Each recipient jurisdiction deposits its share of the revenue into its metal mines reserve account. Money in a metal mines reserve account must be invested with the income accruing to the account. Money may be held in the reserve account for any length of time or may be expended as authorized by law. The county may expend money from its metal mines reserv[illegible]unt only for planning and economic development purposes.

The Hard-Rock Mining Impact Board. The Hard-Rock Mining Impact Board administers the Hard-Rock Mining Impact Act, performs specific duties under the companion Property Tax Base Sharing Act, makes required determinations, and adjudicates certain disputes. The Legislature has instructed the Board that its administrative rules:

> must ensure that implementation of the act is consistent with the purpose of mitigating local government impacts that may result from the commencement of large-scale hard-rock mineral developments in the state.

The Board works with developers and local governments to help them understand what is entailed in preparing, reviewing, implementing and amending impact plans under the Impact and Tax Base Sharing Acts. The Board encourages the affected parties to become informed about the impact statutes and their respective responsibilities, to communicate openly with one another, and to work together cooperatively throughout the process. To facilitate this effort, the Board has prepared a *Guide to the Implementation of the HardRock Mining Impact Act and the Property Tax Base Sharing Act*, which is available for use by all affected parties.

The five-member, quasi-judicial board is appointed by the Governor for staggered four year terms in accordance with statutory criteria. Board members include an elected county commissioner, an elected school district trustee, and representatives of a major financial institution, the mining industry and the public-at-large. Geographically, each of four multi-county districts must be represented on the Board. At least three members must reside in current or potential mine impact areas. The Board is attached to the Local Government Assistance Division of the Department of Commerce for administrative purposes only.

Questions about the Hard-Rock Mining Impact Act and the Property Tax Base Sharing Act may be directed to the Hard-Rock Mining Impact Board, Montana Department of Commerce, P.O. Box 200501, 1424 9th Avenue, Helena, Montana, 59620-0501; phone: 406-444-4478; FAX 406-444-4482.

APPENDIX H
FAILURE MODES AND EFFECTS ANALYSIS

BACKGROUND

Failure Modes and Effects Analysis, or FMEA, is an engineering reliability technique used to systematically identify, characterize, and screen risks that derive from the failure of an engineered system to operate or perform as intended. Originally developed for use in nuclear safety, FMEA has been widely applied, for example, in the chemical industry since the Bhopal, India, disaster and by NASA since the space shuttle *Challenger* accident. Although FMEA does not by itself reduce risks, the systematic risk characterization provides an effective method for designing risk management and mitigation strategies that do. For the mineral withdrawal analyis, FMEA provides for improved understanding and characterization of mining-related risk to water and aquatic resources.

Fundamental to FMEA is the meaning of "risk" defined by Webster's Dictionary as "the possibility of loss". This concept of risk embodies two components: an uncertain state of knowledge about the occurrence of an event and adverse effects produced by the event should it occur. Expressed more simply:

Risk = (likelihood) x (consequences)

To characterize risk, both the relative likelihood of a failure event and its consequences must be accounted for. As a qualitative technique, likelihood and consequences are evaluated in FMEA using professional judgment and opinion. This is accomplished in a workshop format including not just technical experts, but also those more knowledgeable about operation and maintenance of the actual system. The opportunity for interchange and interaction among the workshop participants, using risk as the common denominator, can be among the most important benefits that FMEA provides.

For any complex system, risks derive from many sources. Failure of any one component can directly affect other components or the overall system. FMEA evaluates the failure likelihood and consequences for each individual component, allowing those with highest risk to be identified for further analysis or targeted for risk reduction measures. Only recently have FMEA techniques originally developed for electrical and mechanical systems been adapted to the environmental effects of mining (e.g. Ferguson and Robertson, 1994; Dushnisky and Vick, 1996), but these applications are not conceptually complex. They simply treat the structures and facilities of the mine as system components, and view the consequences of component failure in terms of environmental damage. In this way, these environmental applications of FMEA have achieved the following purposes:

- to systematically identify and catalog those mine structures and facilities whose failure to operate or perform as intended would pose risk to the environment;
- to identify those mine features and potential occurrences that are the dominant risk contributors, as distinct from others that produce comparatively lesser risk; and
- to develop a sense of the overall reliability of the environmental protection features incorporated in mine planning, design, and operations.

At the same time, these FMEA applications function within the context of several assumptions and limitations including the following:

- FMEA does not serve as a quality assurance device, and it assumes that the facilities have been constructed in a way that meets the intent of their design. Human operating error is managed through quality control/quality assurance procedures and operating and decommissioning training.
- FMEA is different from regulatory compliance or environmental audits and it does not fulfill their specific purposes.
- FMEA seeks to characterize risks in a systematic way and is intended to identify the main risks or failure modes. FMEA reflects the information, judgment, and professional opinion available and expressed in the workshop(s) at the time it was performed. Just as these factors may change over time, so too can the assessment of risk be expected to vary according to additional information or the evaluation of others.

FMEA FRAMEWORK

FMEA characteristically includes several steps performed in logical sequence. These are described below for the New World Project FMEA, and summarized for New World Mine alternatives in subsequent tables.

System Description

The FMEA considered the elements of the proposed mine and tailings management system at the New World Project as they are portrayed on Figure H-1. Operating and subsurface conditions were inferred from design reports and procedures described in the workshop. Although, in general, risks to the environment may derive from other smaller sources, the FMEA considered only the major issues arising from the New World mine and tailings facilities.

For an FMEA, a project is divided into a number of key components which group together related facilities and provide a focus for "what can go wrong" with that component. For example, the key components in the Case Study included the tailings dam, mine workings, and water management facilities. Each of the main components are further subdivided into sub-components, and failure modes are identified for various aspects of each component. The failure modes also consider the development phases which include: construction (2 years), operation (10 to 20 years), decommissioning (30 years) and post closure land use (1,000 years).

The components of the systems include a component identification number (ID). This ID is used throughout the FMEA process for consistency.

Consequence Categories

The consequences of any component failure must be described as a member of a mutually exclusive, collectively exhaustive consequence set. Typically, environmental risks can be most readily identified. Consequence categories for the New World FMEA are listed in Table H-1 and separately address the following attributes:

Table H-1 Consequence Categories

CATEGORY	[illegible]
Negligible (N)	• No decrease in Fisher and/or Miller Creek flow • No detectable release of tailings or pond water to surface/groundwater
Low (L)	• Minor decrease in Fisher and/or Miller Creek flow • Minor fluid or tailings releases to surface or groundwater, of localized extent, controllable, and easily and predictably remediated • No significant permanent or residual contaminant concentrations
Moderate (M)	• More significant decrease in Fisher and/or Miller Creek flow • More extensive fluid/solids release to surface/groundwater, still controllable • Can be remediated but with significant effort required • No long-lasting contamination and/or further contaminant migration
High (H)	• Significant decrease in Fisher and/or Miller Creek flow • Significant releases of fluids or solids affecting surface water or groundwater • Can be remediated with great effort, but some long-lasting contamination and/or contaminant migration remains
Extreme (E)	• Major decrease in Fisher and/or Miller Creek flow • Major, uncontrolled releases of fluids or solids to surface water, or chronic, persistent, and widespread releases to groundwater • Surface water contamination cannot be completely remediated, groundwater contamination produces regional-scale effects • Long and perhaps indefinite operational interruption • Extensive or perpetual post-closure mitigation possibly required

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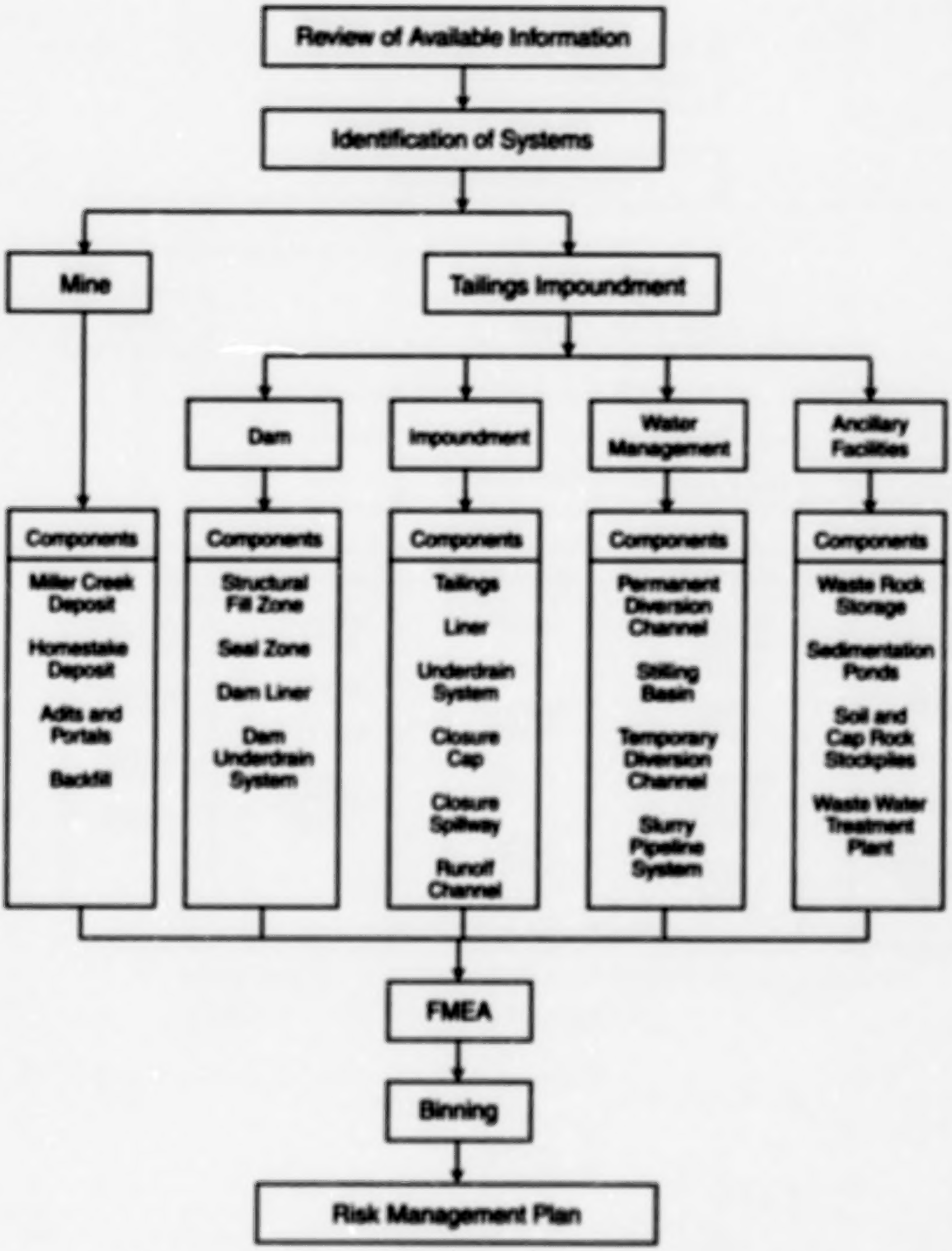
Figure H-1 Steps in FMEA Process



Consequences on water quantity (environmental)

This consequence category is expressed as in terms of decreased creek discharge during a 100-year return period low-flow.

Consequences on water quality (environmental)

This consequence category is expressed as: impact on groundwater; release to surface water; and/or leakage.

Consequences on aquatic life (environmental)

This consequence category addresses impacts on fish and aquatic life and is expressed in terms of species mortality.

The consequences of release of tailings or mine water were further quantified on the basis of potential changes to water quality and hence to aquatic life. Estimates of mine water quality on decommissioning were made. Estimates of water quality from leached, oxidized tailing releases were also made. This analysis is included in Appendix IV of the FMEA Training Case Study Final Report. Table H-5, 6 and 7, further describes potential consequences to water quality, water quantity and aquatic life.

Likelihood Categories

Although failure likelihoods are intended to be qualitative, broad numerical probability ranges are useful in promoting consistency among workshop participants in verbally-expressed judgments. To this end, likelihood categories were defined in Table H-2 for the FMEA.

Sometimes a failure event consists of not just a single occurrence, but a string of events in a failure sequence. In such cases, the likelihood refers to the combined likelihood of the events in the sequence.

The likelihood categories defined are understood to be on an annual basis, and thus must be accumulated over the relevant exposure period. During the life of a project, annual likelihood categories are assumed to adequately approximate cumulative likelihood for the operating period. In other words, failure modes with likelihoods of "moderate" or "high" are very likely to happen at least once during the operating stage of the mine.

However, for the post-mining/care and maintenance stage, annual likelihoods must be addressed for a 1,000-year period, which substantially increases cumulative likelihoods over the corresponding annual categories. For the 1,000-year post-mining land use period, failure modes with likelihoods of "low" are also very likely to happen at least once.

Some risks are not cumulative with time and these include the potential for acid rock drainage and the mining components in which the likelihood is determined by the actual geology, hydrogeology and geochemistry. These risks do not increase with an increasing time exposure.

Confidence Categories

Judgments on likelihood and consequences made by workshop participants may vary substantially in their associated

Table H-2 Failure Likelihoods

[illegible]	[illegible]	[illegible]	[illegible]
Negligible (N)	< 10^{-6}	>1,000,000	Doubt it could happen; similar to the risk of being injured in an elevator ride.
Very Low (VL)	10^{-6} - 10^{-4}	10,000 - 1,000,000	Unlikely to happen; similar to the likelihood of being struck by lightning.
Low (L)	10^{-4} - 10^{-2}	100 - 10,000	It could happen; similar to the likelihood of death from cancer, mountaineering or suicide.
Moderate (M)	10^{-2} - 10^{-1}	10 - 100	Has or probably will happen; similar to the likelihood of failure of mine pit slopes or marine shipping accident.
High (H)	> 10^{-1}	<10	Happens regularly

degree of confidence depending, for example, on amount and consistency of available information or how well the process or effect is understood. Confidence categories that apply to both likelihood and consequence assessments are defined in Table H-3 to reflect these factors.

Table H-3 Confidence Levels

[illegible]	[illegible]
Low (L)	• Do not have confidence in estimate • Could vary significantly
Moderate (M)	• Have some confidence in estimate • Moderate variability
High (H)	• Confident • Low variability

FMEA Workshop

The basic structure of the FMEA combines failure modes identified for each component with the defined likelihood, consequence, and confidence categories. In addition, both current and future compensating factors are addressed. Current factors are those which in various ways have influenced the assigned likelihoods or consequences, while future factors are those which could also be considered to mitigate failure mode risks.

The FMEA reflects the judgments expressed by the support group and Professional Review Panel in the three workshops convened for this project.

Binning

While the completed FMEA tabulation provides the raw information for evaluating failure mode risks, this evaluation must be further developed by a process called "binning". Since risk is defined in terms of likelihood/consequence pairs, binning categorizes these pairs for each component or failure mode. The binning process matches likelihoods with consequences to screen out risks that have a low to moderate likelihood of having a moderate to extreme consequence over the relevant time period of the risk exposure. The time exposure affects the binning for the post closure land use phase, and for this case all risk with a low likelihood were binned out.

To illustrate, binning might be conducted according to general categories such as those given in Table H-4.

The level of confidence was also factored into the binning process. For example, risks with low to moderate confidence limits could become a higher risk and therefore could require further consideration. The results of binning for the completed New World FMEA are not included in this Appendix, but are included in the Final Report.

Compensating Factors

During the FMEA process each risk item was assessed with respect to *what compensating factors could reduce the risk?*. Compensating factors, for example, could include design changes or more detailed studies. The compensating factors, along with the revised probability of occurrence and confidence level were incorporated into the FMEA tables. The compensating factors would be incorporated into a risk management plan for the project and the remaining *Post Compensation Binning* would then present the risks remaining with good risk management practices.

Table H-4 Binning of Likelihood/Consequence Pairs

[illegible]	[illegible]
"Low" likelihood/"low" consequences	Low risk, not a significant failure mode
"High" likelihood/"high" consequences	Major risk, possibly constituting "fatal flaw"
"Moderate" likelihood/"moderate" consequences	Intermediate risk requiring individual consideration
"High" likelihood/"low" consequences	Failure mode occurs frequently without serious effect. Often amendable to improved operational or monitoring procedures
"Low" likelihood/"high" consequences	Risk commonly associated with effects of extreme events (e.g., floods, earthquakes) on critical components

Table H-5 Consequence Categories - Water Quality

CATEGORY	GROUNDWATER QUALITY	SURFACE WATER QUALITY			
		pH	SO_4	METALS	SUSPENDED SEDIMENT
Negligible (N)	No degradation	No Change	No Change	No Change	No Change
Low (L)	All degradation contained onsite	pH > 6	Sulphate concentration < 500 mg/L	Potential for concentrations to reach Montana water standards for surface water offsite	Sediment load between curent* and twice baseline
Moderate (M)	Potential for concentrations in offsite wells to reach Montana water for drinking water in offsite wells	5 < pH < 6	Sulphate concentration between 500 mg/L and 1,000 mg/L	Exceedance of Montana water standards for surface water offsite	Sediment load between twice and 5 times baseline
High (H)	Exceedance of Montana water standards for drinking water in offsite wells	3 < pH < 5	Sulphate concentration between 1,000 mg/L and 10,000 mg/L	Up to 10 times Montana water standards for surface water offsite	Sediment load between 5 and 100 times baseline
Extreme (E)	Over 100 times Montana water standards for drinking water in offsite wells	pH < 3	Sulphate concentration > 10,000 mg/L	Up to 100 times Montana water standards for surface water offsite	Sediment load greater than 100 times baseline

CATEGORY	SURFACE WATER QUALITY			
	LOW-PYRITIC TAILINGS RELEASE	MIXED TAILINGS RELEASE	PYRITIC TAILINGS RELEASE	NITRATE
Negligible (N)	None	None	None	No Change
Low (L)	< 1 ton	< 1 ton	< 1 ton	< 0.2 mg/L
Moderate (M)	Between 1 and 1,000 tons	Between 1 and 100 tons	Between 1 and 10 tons	Between 0.2 and 10 mg/L
High (H)	Between 1,000 and 10,000 tons	Between 100 and 1,000 tons	Between 10 and 100 tons	> 10 mg/L
Extreme (E)	More than 10,000 tons	More than 1,000 tons	More than 100 tons	> 100 mg/L

*Current sediment levels: Fisher 32% over baseline; Miller 32% over baseline; Daisy 60% over baseline; Upper Soda Butte 31% over baseline.
(Baseline sediment load is the sediment generated from the watershed assuming no development using USFS R1/R4 sediment model.)

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Table H-6 Consequence Categories - Water Quantity

CATEGORY	IMPACT	
	MILLER CREEK*	FISHER CREEK**
Negligible (N)	No reduction in flow	No reduction in flow
Low (L)	Reduction by < 2.8 L/s (0.1 cfs) or 10% of low flows at SW-2	Reduction by < 5.7 L/s (0.2 cfs) or 10% of low flows at SW-4
Moderate (M)	Reduction of between 2.8 L/s and 8.5 L/s (0.1 cfs and 0.3 cfs) or 10% to 30% of low flow at SW-2	Reduction of between 5.7 L/s and 28.3 L/s (0.2 cfs and 1.0 cfs) or 10% to 50% of low flow at SW-4
High (H)	Reduction of > 8.5 L/s (0.3 cfs) or 30% of low flow at SW-2	Reduction of 28.3 L/s (1.0 cfs) or 50% of low flow at SW-4
Extreme (E)	Creek runs dry	Creek runs dry

* Low flows in Miller Creek are based on a September 1995 low flow of 1.0 cfs at SW-2. A 10 % flow reduction in Miller Creek results in approximately a 2.3% reduction in Soda Butte Creek at SBC-2 and approximately a 0.27% reduction in Soda Butte Creek at SBC-4. Miller Creek impacts are limited by potential reductions in streamflow in Soda Butte Creek at the YNP Boundary and Augmentation Compliance provisions of the NPS/DNRC compact.

** Low flows in Fisher Creek are based on a September 1993 low flow of 2.0 cfs at SW-4. Fisher Creek impacts are limited by potential impacts to aquatic biota (algae, macroinvertebrates and existing wetlands.

Table H-7 Consequence Categories - Aquatic Life

CATEGORY	CHRONIC CRITERION (factor)	IMPACT
Negligible (N)	1X	• No impact on aquatic life or habitat
Low (L)	2X	• Minimal impact on aquatic life or habitat • Less than 20% mortality
Moderate (M)	4X	• Localized, short-term, reversible impact on aquatic life or habitat • 20-50% mortality
High (H)	8X	• Widespread, long-term impact on aquatic life or habitat • 50-90% mortality
Extreme (E)	12X	• Severe, potentially irreversible impact on aquatic life or habitat • Over 90% mortality

FMEA SUMMARY TABLES

The following tables summarize the FMEA results for alternatives previously under consideration for the New World Mine. The tables, copied directly from the FMEA Final Report, are listed in order by alternative.

Table H-1, FMEA for New World Underground Mine (Alternative 3 with Pyritic Tailings on Sheep Mountain) also applies to alternative 4 through 8; consequently, that table is not repeated for those alternatives.

[illegible] FMEA Table for Ancillary Systems (Alternative 2, Crown [illegible] Proposal), also applies to Alternatives 3, 5, and 6, and consequently is not repeated for those alternatives.

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Table 6.2 FMEA for New World Underground Mine (Alternative 2 - Crown Butte Proposal)

COMPONENT	ID	FAILURE MODE OR POTENTIAL PROBLEM	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES: WATER QUANTITY	CONSEQUENCES: WATER QUALITY	CONSEQUENCES: AQUATIC LIFE	CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION: LIKELIHOOD CATEGORY	POST-COMPENSATION: CONFIDENCE LEVEL
Miller Creek Deposit	1.1.01	Groundwater previously moving to Miller Creek discharges into the mine	Reduction in Miller Creek baseflow	C,O	H	L	-	-	M	Augmented streamflows to Miller Creek, control of blasting to reduce fracturing	L	M
				D,P	H	L	-	-	M	Augmented streamflows to Miller Creek	L	M
	1.1.02		Degradation of water quality	O	L	-	M	L*	M			
				D,P	M	-	M	L*	M	Treat and replace	VL	M
	1.1.03	Major (unexpected) structures or mine rock has higher hydraulic conductivity than expected	Lower water table over mine, sulphide oxidation**	C	M	M	H	H	M	Selective grouting of transmissive features in advance of mine	VL	M
				O,D,P	M	M	M	L*	M	Selective grouting of transmissive features, plug adit	VL	M
	1.1.04	Blasting	Elevated ammonia and nitrate in groundwater	O	VL	-	M	L*	M			
				D	M	-	M	L*	H	Monitor for nitrogen	L	M
				P	VL	-	L	L*	H			
Homestake Deposit	1.2.01	Groundwater previously moving to Fisher Creek discharges into the mine	Reduction in Fisher Creek baseflow	C,O	M	L-M	-	-	H	Augment streamflow	VL	M
				D	M	L	-	-	M	Augment streamflow	VL	M
				P	H	L	-	-	M	Augmented streamflows	VL	H
	1.2.02		Degradation of water quality	O	L	-	M	M	M			
				D,P	M	-	M	M	M	Treat and replace	VL	M
	1.2.03	Major (unexpected) structures or mine rock has higher hydraulic conductivity than expected	Lower water table over mine, sulphide oxidation	C, O	L	M	H	H	M		VL	M
				D,P	M	M	M	M	M	Treat and replace adit plugs	L	M
	1.2.04	Blasting	Elevated ammonia and nitrate in groundwater	O	VL	-	M	M	M			
				D	M	-	M	M	H	Monitoring network to detect nitrogen compounds	L	M
				P	VL	-	L	L	H			
Adits and Portals	1.3.01	Failure of portal plugs	Loss of groundwater to adit, lowering of water table, decrease of discharge to Miller and Fisher Creeks and reduction of water quality in Upper Creeks	P	L	M	L-M	L-M	M	Backup "wall" plugs	VL	M
	1.3.02	Water table does not return to original state even with plug	Continued, long-term reduction in Miller/Fisher Creek baseflow	D	H	L	L	L	M	Backup wall plugs	L	M
				P	M-H	L	L	L	M	Backup wall plugs	L	M
Backfill: Coarse tailings and cement	1.4.01	Incomplete backfill	Subsidence or rockfall	O,D,P	L	M	L	L	L-M	Use paste and/or cemented backfill	L	H
	1.4.02		Sulphide oxidation	O,D,P	M	-	M	M	L-M	Use paste and/or cemented backfill	L	H

* No impact on fisheries (Miller Creek naturally devoid of fish), possible impact on invertebrates

** Incremental effects over 1.1.01 and 1.1.02

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Table 6.3 FMEA Table for Tailings Dam (Alternative 2 - Crown Butte Proposed)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Dam (Final Stage) / Structural Fill Zone	2.1.01	Surface erosion of dam by rainfall, with sediment control	Increased sediment load to streams and possible dam breach	C,O,D	M	L	L	H			
				P	M	M	H	M	Care and maintenance	VL	M
	2.1.02	Static instability	Release of tailings and water	O,D,P	VL	H-E	H-E	M	Monitoring, design QA/QC	H	H
	2.1.03	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	VL	H-E	H-E	M	Dam design, monitoring	VL	H
	2.1.04	Differential settlement	Release of tailings and water	C,O,D,P	H	H	H	H	Monitoring, Design		
	2.1.05	Poor water management	Overtopping of dam and release of tailings and water	O,D	L	H-E	H-E	H	Monitoring, good water management, emergency spillway	VL	H
	2.1.06	Major avalanche that covers tailings pond	Erosion of dam, release of tailings and water	O,D,P	VL	M	M	M	Long-term monitoring	VL	H
	2.1.07	Flood in excess of design flood	Overtopping of dam and release of tailings and water	P	VL	H-E	H-E	M	On-going PMP/PMF studies, emergency spillway	VL	H
	2.1.08	Vandalism	Destruction of dam	C,O,D,P	VL	H-E	H-E	L	Monitoring	VL	H
Dam (Stage 1) / Structural Fill Zone[1]											
Dam / Liner (Imported Soil Layer, Geomembrane, Cushion Layer) and Seal Zone	2.2.01	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,D,P	L	L	L	M	Filters in dam, Seal zone will control hydraulic gradient	VL	H
	2.2.02	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	M	L	L	H	Part of liner constructed to maintain overall integrity	VL	H
	2.2.03	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,D	VL	H	H	M	Monitoring, draw down pond	VL	H
				P	VL	M	M	M	Tailings will be low permeability	VL	H
	2.2.04	Seal zone/liner does not filter tailings	Piping of tailings through [illegible] zone liner sinkhole	O,D	L	H	H	M	Design filter zone in dam	VL	H
				P	L	M	M	M	Filters	VL	H
	2.2.05	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	L	M	M	M	Care and maintenance	VL	M
Dam / Pond Underdrain System	2.3.01	Pipe plugging increases head upstream of cutoff	Piping and dam failure	O,D	L	H	H	M	Monitoring, QA/QC	VL	H
Dam / Blanket Underdrain	2.3.02	Sealing/Plugging (ARD precipitation)	Uncontrolled seepage and dam failure	O,D,P	VL	M	M	H			
	2.3.03	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,D	L	M	M	M	Design	VL	H
				P	L	L	L	H	Design	VL	M

[1] Behaves like Final Dam during all project stages

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Table 6.4 FMEA Table for Tailings Impoundment (Alternative 2 - Crown Butte Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Impoundment / Main body (Tailings and Pond)	3.1.01	Drought	Desiccation of tailings, ARD generation and wind erosion	O	VL	L	L	H	Proper water management (storage of water in impoundment), design	N	H
	3.1.02	Avalanche	Release of tailings	O	L	L	L	H	Monitoring, maintenance	L	H
Impoundment / Liner	3.2.01	Uplift between drains	Disturb and/or rupture liner system, release tailings and water	O	M	H	H	M	Design, construction QA/QC	VL	M
	3.2.02	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner system and loss of tailings and water through liner	O	L-M	H	H	M	Monitoring, construction QA/QC	VL	M
	3.2.03	Chemical decomposition due to long term liner integrity	Rupture of HDPE layer	P	M	L	L	H	Design for no HDPE layer	VL	H
	3.2.04	Differential settlement of foundation	Rupture of liner system and loss of tailings and water through liner	O	M	H	H	M	Design	VL	H
				D,P	L	H	H	M	Design for no liner	VL	H
	3.2.05	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner system	O,D,P	L	M	M	M	Maintenance	VL	M
Impoundment / Main Underdrain and Branch Underdrains	3.3.01	Pipe plugging increases head upstream of cutoff	Lifts and damages liner system	O	VL	H	H	M	Monitoring, upstream pumping	VL	H
	3.3.02	Pipes break due to chemical breakdown	Piping and dam failure	P	VL	L	L	H			
Impoundment / Underdrain Collection System (Tank, Pump, Pond)	3.3.03	Power failure	Release of contaminated water to natural drainage	O	M	M	M	M	Monitoring, backup power source	VL	H
	3.3.04	Freezing	Release of contaminated water to natural drainage	O	M	M	M	M	Monitoring, QA/QC	VL	H
	3.3.05	Line break	Release of contaminated water to natural drainage	O	P	M	M	M	Monitoring, QA/QC	VL	H
	3.3.06	Excess water to collection system	Release of contaminated water to natural drainage	O	M	M	M	M	Monitoring	L	H

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Table 6.4 FMEA Table for Tailings Impoundment (Alternative 2 - Crown Butte Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES: WATER QUALITY	CONSEQUENCES: AQUATIC LIFE	CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION: LIKELIHOOD CATEGORY	POST-COMPENSATION: CONFIDENCE LEVEL
Impoundment / Closure Cap	3.4.01	Early mine shutdown	Lack of sufficient tailings leads to impoundment completely filled with water, i.e., no wetlands	D,P	L-M	M	M	M	Adjust design for early mine shutdown	VL	M
	3.4.02	Final tailings configuration not amenable to designed cap	Impact on water balance, pond water quality	D,P	M-H	H	H	H	Place tailings by barge, dry placement of tailings	VL	M
	3.4.03	Differential or large consolidation	Runoff channel cracks, pond forms behind dam	D,P	M	M*	M*	M	Long-term maintenance and monitoring, combination of [illegible] and consolidation	VL	M
	3.4.04	Oxidation of tailings	[illegible]	D,P	L	L	L	M	Vegetation plan	VL	H
	3.4.05	Tailings liquefaction	Disturbs cap	D,P	M	H	H	M	Place thicker cap	VL	M
	3.4.06	Drought	Tailings become unsaturated and ARD generation occurs	D,P	VL	M	M	M	Long-term water management	VL	H
	3.4.07		Loss of vegetation, erosion of cap soil	D,P	VL	L	L	M	Long-term water management	VL	H
	3.4.08	Exposed waste rock in impoundment	ARD generation	D,P	VL	M	M	M	[illegible]	VL	H
	3.4.09	Tree roots	Failure of soil cap	P	L	L	L	M	Cut down trees on regular basis	VL	H
	3.4.10	Avalanche	Failure of cap, disruption of runoff channel	D,P	M	L	L	M	Design cover to withstand avalanche	VL	H
Impoundment / Closure Spillway and Runoff Channel	3.5.01	Debris buildup	Decrease in flow capacity	D,P	M	H	H	M	Emergency spillway at downstream end, care and maintenance	VL	M
	3.5.02	Large flood	Overtopping of dam, erosion of [illegible]	D,P	VL	M-H	M-H	M	Emergency spillway at downstream end, care and maintenance	VL	H

Table 4.5 FMEA Table for Water Management Systems (Alternative 3 - [illegible] Basin Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECT(S)	PROJECT PHASE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Water Management / Permanent Diversion Channel and Settling Basin	4.1.01	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dyke	C,O,P	VL	L	L	M	Monitoring, maintenance	VL	H
	4.1.02	Sedimentation	Increase in bed load. Change in channel geometry	C,O	M	L	L	M	Monitoring, sediment trap, care and maintenance	L	H
				P	M	H	H	M	Monitoring, sediment trap, care and maintenance	VL	M
	4.1.03	Large flood	Blockage of [illegible] slope section of channel	C,O,P	M	M	M	M	Sediment trap, care and maintenance	VL	M
	4.1.04	Large flood when channel is plugged	Water flows through dam [illegible], causing erosion of toe of dam	C,O	VL	M-H	M-H	M	Monitoring, maintenance	VL	H
				P	L	M-H	M-H	M	Repair dyke	VL	M
	4.1.05	Undercutting at diversion inlet	Dyke erosion at upstream end, release of pond water	C,O	L	M	M	M	Design, care and maintenance	VL	H
				P	L	L	L	M	Design, care and maintenance	VL	M
	4.1.06	Undercutting at outlet	Dyke erosion at downstream end and dam failure	C,O	VL	M-H	M-H	M	Design, care and maintenance	VL	H
				P	L	M-H	M-H	M	Design, care and maintenance	VL	M
	4.1.07	Snow, avalanche	Decrease in flow capacity and flooding	C,O,P	L	H	H	H	Monitoring, emergency spillway or [illegible], care and maintenance	VL	M
	4.1.08	Avalanche	Breach of dam crest, release of tailings and water	C,O,P	VL	M	M	H			
	4.1.09	Ice jamming of channel (glaciation)	Flooding	C,O,P	VL	H	H	M	Monitoring, maintenance	VL	M
	4.1.10	Unforeseen debris build up due to beaver, etc.	Damming of channel	P	M	H	H	M	Continuous monitoring at least annually, design	VL	M
	4.1.11	Water table rises in lateral dyke	Unstable dyke	C,O	L	L	L	M	Design filter zone	VL	H
	4.1.12	Settling basin undercapacity designed	Increased sediment loading to stream	C,O,P	M	M	M	M	Design	VL	H
Water Management / Temporary Diversion Channel	4.1.13	Debris flow	Lateral sediment loading	O	L	L	L	H			
	4.1.14	Sedimentation	Increase in bed load, change in channel geometry	O	L	L	L	H			
	4.1.15	Snow, avalanche	Decrease in flow capacity and flooding	O	L	L	L	H			
	4.1.16	Ice jamming of channel (glaciation)	Flooding	O	L	L	L	H			
	4.1.17	Flood in excess of design flood	Decrease in flow capacity and flooding	O	VL	M	M	H			
Water Management / Slurry Pipeline System (HDPE Pipe)	4.2.01	Pipeline break	Spill of poor quality water to creek	O	M	M	M	M	Monitoring instrumentation, maintenance	L	H

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Table 6.5 FMEA Table for Water Management Systems (Alternative 2 - Crown Butte Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECT(S)	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Pump, Containment Channel	4.2.02	Power outage at water reclaim pump	Decrease in reclaim flows to mill	O	H	N	N	M	Back-up power source	VL	H
Water Management / Water Treatment Plant and Polishing Pond	4.3.01										

Table 6.6 FMEA Table for Ancillary Systems (Alternative 2 - Crown Butte Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Ancillary Systems / Temporary Waste Rock Stockpile and Sedimentation Pond	5.1.01	Pile fails	Increase in sediment loading to Fisher Creek	C,O	M	M	M	M	Monitoring, maintenance	VL	H
	5.1.02	Debris flow, avalanche	Increase in sediment loading to Fisher Creek	C,O	L	L	L	M	Monitoring, maintenance	VL	H
	5.1.03	Flood in excess of sedimentation pond design storm (10-year, 24-hour)	Increase in sediment loading to Fisher Creek	C,O	H	L	L	M	Design for larger flood, treat runoff water	M	H
	5.1.04	Seepage collection system fails (e.g., over capacity)	Transport of acidic water to Fisher Creek	C,O	M	L	L	M	Monitoring, maintenance, treat runoff water	L	H
	5.1.05	Liner fails	Transport of ARD to Fisher Creek	C,O	M	L	L	M	Monitoring, maintenance, treat runoff water	L	H
Ancillary Systems / Temporary Cap Rock and Soil Stockpiles	5.1.06	Pile fails	Increase in sediment loading to Fisher Creek	O	M	M	M	M	Monitoring, maintenance	VL	H
	5.1.07	Debris flow, avalanche	Increase in sediment loading to Fisher Creek	O	VL	L	L	M	Monitoring, maintenance	VL	H
	5.1.08	Failure of slash filters	Increase in sediment loading to Fisher Creek	O	L	L	L	M	Monitoring, maintenance	L	H
Ancillary Systems / Stream Crossing	5.2.01	Failure of stream crossing		C,O					Engineered stream crossing		

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Table H-1 FMEA for New World Underground Mine (Alternative 3 - Fisher Creek with Pyritic Tailings on Sheep Mountain)

COMPONENT	ID	FAILURE MODE OR POTENTIAL PROBLEM	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES			CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUANTITY	WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Miller Creek Deposit	1.1.01	Groundwater previously moving to Miller Creek discharges into the mine	Reduction in Miller Creek baseflow	C,O,D,P	Same as for Alternative 2							
	1.1.02	Groundwater previously moving to Miller Creek discharges into the mine	Degradation of water quality	O,D,P	Same as for Alternative 2							
	1.1.03	Major (unexpected) structures or mine rock has higher hydraulic conductivity than expected	Lower water table over mine, sulphide oxidation	C,O,D,P	Same as for Alternative 2							
	1.1.04	Blasting	Elevated ammonia and nitrate in groundwater	O,D,P	Same as for Alternative 2							
Homestake Deposit	1.2.01	Groundwater previously moving to Fisher Creek discharges into the mine	Reduction in Fisher Creek baseflow	C,O,D,P	Same as for Alternative 2							
	1.2.02	Groundwater previously moving to Fisher Creek discharges into the mine	Degradation of water quality	O,D,P	Same as for Alternative 2							
	1.2.03	Major (unexpected) structures or mine rock has higher hydraulic conductivity than expected	Lower water table over mine, sulphide oxidation	C,O,D,P	Same as for Alternative 2							
	1.2.04	Blasting	Elevated ammonia and nitrate in groundwater	O,D,P	Same as for Alternative 2							
Adits and Portals	1.3.01	Failure of portal plugs	Loss of groundwater to adits, lowering of water table, decrease of discharge to Miller and Fisher Creeks and reduction of water quality in Upper Creeks	P	Same as for Alternative 2							
	1.3.02	Water table does not return to original state even with plug	Continued, long-term reduction in Miller/Fisher Creek baseflow	D,P	Same as for Alternative 2							
Backfill: High-density paste backfill	1.4.01	Incomplete backfill	Subsidence or rockfall	O,D,P	Same as for Alternative 2							
	1.4.02		Sulphide oxidation	O,D,P	L	L	M	M	L-M			
	1.4.03		Reduction of flow to Upper Miller Creek	O,D,P	L	M	L	L	L-M			

Table H-2 FMEA Table for Tailings Dams (Alternative 3 - Fisher Creek with Pyritic Tailings on Sheep Mountain)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Dam (Final Stage) / Structural Fill Zone	2.1.01-LP	Surface erosion of dam by rainfall, wind	Increased sediment load to streams over baseline	C,O,D	Same as for Alternative 2						
				P	M	M	M	M	Care and maintenance	VL	M
	2.1.02-LP	Static instability	Release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.03-LP	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.04-LP	Differential settlement	Release of tailings and water	C,O,D,P	Same as for Alternative 2						
	2.1.05-LP	Poor water management	Overtopping of dam and release of tailings and water	O,D	Same as for Alternative 2						
	2.1.06-LP	Avalanche	Release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.07-LP	Flood in excess of design flood	Release of tailings and water	P	Same as for Alternative 2						
	2.1.08-LP	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 2						
Pyritic Dam (Final Stage) / Structural Fill Zone	2.1.01-P	Surface erosion of dam by rainfall, wind	Increased sediment load to streams over baseline	C,O,D	Same as for Alternative 2						
				P	M	E	E	M	Care and maintenance	VL	M
	2.1.02-P	Static instability	Release of tailings and water	O,D,P	VL	E	E	M	Monitoring, design QA/QC	L	M
	2.1.03-P	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	VL	E	E	M	Over design, monitoring	VL	H
	2.1.04-P	Differential settlement	Release of tailings and water	C,O,D,P	Same as for Alternative 2						
	2.1.05-P	Poor water management	Overtopping of dam and release of tailings and water	O,D	Same as for Alternative 2						
	2.1.06-P	Avalanche	Release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.07-P	Flood in excess of design flood	Release of tailings and water	P	Same as for Alternative 2						
	2.1.08-P	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 2						

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Table H-2 FMEA Table for Tailings Dams (Alternative 3 - Fisher Creek with Pyritic Tailings on Sheep Mountain)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES WATER QUALITY	CONSEQUENCES AQUATIC LIFE	CONSEQUENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION LIKELIHOOD CATEGORY	POST-COMPENSATION CONSEQUENCE LEVEL
Low-Pyritic Dam / Liner and Seal Zone	2.2.01-LP	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,C,P	Same as for Alternative 2						
	2.2.02-LP	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 2						
	2.2.03-LP	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,C,P	Same as for Alternative 2						
	2.2.04-LP	Soil zone/filter does not filter tailings	Piping of tailings through liner/seal zone forms sinkholes	O,C,P	Same as for Alternative 2						
	2.2.05-LP	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	Same as for Alternative 2						
Pyritic Dam / Liner and Seal Zone	2.2.01-P	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,C,P	Same as for Alternative 2						
	2.2.02-P	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 2						
	2.2.03-P	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,C,P	Same as for Alternative 2						
	2.2.04-P	Soil zone/filter does not filter tailings	Piping of tailings through liner/seal zone forms sinkholes	O,C,P	Same as for Alternative 2						
	2.2.05-P	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	Same as for Alternative 2					VL	M
Pyritic Dam / Pond Underdrain System	2.3.01-LP	Pipe plugging increases head (pressure) of runoff	Piping and dam failure	O,C	Same as for Alternative 2						
Low-Pyritic Dam / Pond Underdrain System	2.3.01-P	Pipe plugging increases head (pressure) of runoff	Piping and dam failure	O,C	Same as for Alternative 2						
Pyritic Dam / Blanket Underdrain	2.4.01-LP	Sealing/Plugging (ARD precipitation)	Uncontrolled seepage and dam failure	O,C,P	Same as for Alternative 2						
	2.4.02-LP	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,C,P	Same as for Alternative 2						
Low-Pyritic Dam / Blanket Underdrain	2.4.01-P	Sealing/Plugging (ARD precipitation)	Uncontrolled seepage and dam failure	O,C,P	Same as for Alternative 2						
	2.4.02-P	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,C	Same as for Alternative 2						
				P	L	L	L	M		VL	M

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Table H-3 FMEA Table for Tailings Impoundments (Alternative 3 - Fisher Creek with Pyritic Tailings on Sheep Mountain)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Impoundment / Main body (Tailings and Pond)	3.1.01-LP	Drought	Desiccation of tailings, ARD generation and wind erosion	O	Same as for Alternative 2						
	3.1.02-LP	Avalanche	Release of tailings	O	Same as for Alternative 2						
Pyritic Impoundment / Main body (Tailings and Pond)	3.1.01-P	Drought	Desiccation of tailings, ARD generation and wind erosion	O	Same as for Alternative 2						
	3.1.02-P	Avalanche	Release of tailings	O	L	L	L	H	Monitoring, maintenance	L	H
Low-Pyritic Impoundment / Liner	3.2.01-LP	Uplift between drains	Disturb and/or rupture liner, release tailings and water	O	Same as for Alternative 2				Design	VL	H
	3.2.02-LP	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner and loss of tailings and water through liner	O	Same as for Alternative 2					VL	M
	3.2.03-LP	Chemical decomposition due to long-term liner integrity	Rupture of liner	P	Same as for Alternative 2						
	3.2.04-LP	Differential settlement of foundation	Rupture of liner and loss of tailings and water through liner	C,O,P	Same as for Alternative 2						
	3.2.05-LP	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner	C,O,P	VL	L	L	M	Assume liner	VL	H
Pyritic Impoundment / Liner	3.2.01-P	Uplift between drains	Disturb and/or rupture liner, release tailings and water	O	L	H	H	M	Design, construction QA/QC	VL	H
	3.2.02-P	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner and loss of tailings and water through liner	O	Same as for Alternative 2					VL	M
	3.2.03-P	Chemical decomposition due to long-term liner integrity	Rupture of liner	P	Same as for Alternative 2						
	3.2.04-P	Differential settlement of foundation	Rupture of liner and loss of tailings and water through liner	C,O,P	L	H	H	M	Design for no liner	VL	H
	3.2.05-P	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner	C,O,P	Same as for Alternative 2					VL	H

Table II-3 FMEA Table for Tailings Impoundments (Alternative 3 - Fisher Creek with Pyritic Tailings on Sheep Mountain)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyrite Impoundment / Main Underdrain and Branch Underdrains	3.3.01-LP	Pipe plugging increases head upstream of cutoff	Lifts and damages loss	O	Same as for Alternative 2						
	3.3.02-LP	Pipe break due to chemical breakdown	Piping and dam failure	O	Same as for Alternative 2						
Pyrite Impoundment / Main Underdrain and Branch Underdrains	3.3.01-P	Pipe plugging increases head upstream of cutoff	Lifts and damages loss	O	Same as for Alternative 2						
	3.3.02-P	Pipe break due to chemical breakdown	Piping and dam failure	O	Same as for Alternative 2						
Low-Pyrite Impoundment / Underdrain Collection System (Tank, Pump, Pond)	3.3.03-LP	Power failure	Release of water to natural drainage	O	Same as for Alternative 2						
	3.3.04-LP	Freezing	Release of water to natural drainage	O	Same as for Alternative 2						
	3.3.05-LP	Line break	Release of water to natural drainage	O	Same as for Alternative 2						
	3.3.06-LP	Excess water to collection system	Release of water to natural drainage	O	Same as for Alternative 2						
Pyrite Impoundment / Underdrain Collection System (Tank, Pump, Pond)	3.3.03-P	Power failure	Release of water to natural drainage	O	Same as for Alternative 2						
	3.3.04-P	Freezing	Release of water to natural drainage	O	Same as for Alternative 2						
	3.3.05-P	Line break	Release of water to natural drainage	O	Same as for Alternative 2						
	3.3.06-P	Excess water to collection system	Release of water to natural drainage	O	Same as for Alternative 2						

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Table H-3 FMEA Table for Tailings Impoundments (Alternative 3 - Fisher Creek with Pyritic Tailings on Sheep Mountain)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT PHASE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyrite Impoundment / Closure Cap	[illegible]	Final tailings configuration not amenable to designed cap	Impact on water balance, poor water quality	R,P	Same as for Alternative 2				Plan tailings for large, dry placement of tailings	VL	H
	[illegible]	Tailings liquefaction	Unstable cap	R,P	L	L	L	M	Place flexible cap	L	H
	[illegible]	Avalanche	Failure of cap, disruption of runoff channels	R,P	Same as for Alternative 2						
	[illegible]	Tailings become unsaturated	Contaminated seepage water flows to Fisher Creek	R,P	VL	L	L	M	Place flexible cap	VL	H
Pyritic Impoundment / Closure Cap	[illegible]	Early mine shutdown	Lack of sufficient tailings mass in impoundment completely filled with water, i.e., no wetlands	R,P	Same as for Alternative 2					VL	M
	[illegible]	Final tailings configuration not amenable to designed cap	Impact on water balance, poor water quality	R,P	L	M	M	H	Plan tailings for large, dry placement of tailings	VL	M
	[illegible]	Differential or large consolidations	Overall channel cracks, pond forms behind dam	T,P	L	M	M	M	Long-term maintenance and monitoring, combination of above monitoring and consolidation	VL	M
	[illegible]	Oxidation of tailings	[illegible]	R,P	Same as for Alternative 2						
	[illegible]	Tailings liquefaction	Unstable cap	R,P	L	M	M	M	Place flexible cap	L	H
	[illegible]	Drought	Tailings become unsaturated and ARD generation occurs	R,P	Same as for Alternative 2						
	[illegible]	Drought	Loss of vegetation, erosion of cap soil	R,P	Same as for Alternative 2						
	[illegible]	Tree roots	Failure of soil cap	P	Same as for Alternative 2						
	[illegible]	Avalanche	Failure of cap, disruption of runoff channels	R,P	Same as for Alternative 2						
Low-Pyrite Impoundment / Closure Spillway	[illegible]	Debris loading	Decrease in flow capacity	R,P	Same as for Alternative 2				Care and maintenance		
	[illegible]	Large flood	Overtopping of dam, erosion of [illegible]	R,P	Same as for Alternative 2				Care and maintenance		
Pyritic Impoundment / Closure Spillway and Runoff Channel	[illegible]	Spillway failure	Overtopping of dam, erosion of [illegible]	R,P	VL	H	H	M	Emergency spillway at downstream end, care and maintenance	VL	M

Table H-4 FMEA Table for Water Management Systems (Alternative 3 - Fisher Creek with Pyritic Tailings on Sheep Mountain)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONSEQUENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONSEQUENCE LEVEL
Pyritic Water Management / Permanent Diversion Channel	4.1.01-P	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dyke	O,D	Same as for Alternative 2						
	4.1.02-P	Sedimentation	Increase in bed load, Change in channel geometry	O,D,P	VL	L	L	N	Monitoring, rock trap	VL	N
	4.1.04-P	Large flood when channel is plugged	Possible erosion of toe of dam	O,D,P	Same as for Alternative 2			N		VL	N
	4.1.05-P	Sidecutting at diversion inlet	Dyke erosion at upstream end, release of pond water	O,D,P	Same as for Alternative 2			N		VL	N
	4.1.06-P	Sidecutting at outlet	Dyke erosion at downstream end and dam failure	O,D,P	Same as for Alternative 2			N		VL	N
	4.1.07-P	Snow, avalanche	Decrease in flow capacity and flooding	O,D,P	Same as for Alternative 2			N		VL	N
	4.1.08-P	Avalanche	Breach of dam crest, release of tailings and water	O,D,P	VL	H	H	N			
	4.1.09-P	Ice jamming of channel (glaciation)	Flooding	O,D,P	Same as for Alternative 2						
	4.1.10-P	Tree/organic debris build up due to beaver, etc.	Damming of channel	P	L	L	L	M	Continuous monitoring at least biennially, design channel with wider floodplain	VL	N
	4.1.11-P	Water table rises in lateral dyke	Breaks liner	C,O	Same as for Alternative 2					VL	N
Low-Pyritic Water Management / Temporary Diversion Channel	4.1.13-LP	Debris flow	Lateral sediment loading	O	Same as for Alternative 2						
	4.1.14-LP	Sedimentation	Increase in bed load, change in channel geometry	O	Same as for Alternative 2						
	4.1.15-LP	Snow, avalanche	Decrease in flow capacity and flooding	O	Same as for Alternative 2						
	4.1.16-LP	Ice jamming of channel (glaciation)	Flooding	O	Same as for Alternative 2						
	4.1.17-LP	Flood in excess of design flood	Decrease in flow capacity and flooding	D	Same as for Alternative 2						

Table H-4 FMEA Table for Water Management Systems (Alternative 3 - Fisher Creek with Pyritic Tailings on Sheep Mountain)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01-LP	Pipeline break	Decrease in flows to impoundment	O	Same as for Alternative 2						
	4.2.02-LP	Power outage at water reclaim pumps	Decrease in reclaim flows to mill	O	Same as for Alternative 2						
Pyritic Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01-P	Pipeline break	Spill of poor quality water to creek	O	H	M	M	M	Monitoring instrumentation, maintenance	L	H
	4.2.02-P	Power outage at water reclaim pumps	Decrease in reclaim flows to mill	O	Same as for Alternative 2						
	4.2.03-P	Power outage at slurry pipeline pump	Failure to pump pyritic tailings (spill), build up of tailings at mill site	O	H	M	M	M	Back-up power source, dump sumps along pipeline	L	H

Table H-7 FMEA Table for Tailings Dam (Alternative 4 - Off-Site Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Off-Site Dam (Final Stage) / Structural Fill Zone	3.1.01	Surface erosion of dam by rainfall, wind	Increased sediment load to streams over baseline	C,O,D	Same as for Alternative 3						
				P	M	L	L		Care and maintenance	VL	
	3.1.02	Static instability	Release of tailings and water	O,D,P	Same as for Alternative 3						
	3.1.03	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	Same as for Alternative 3						
	3.1.08	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 3						
Off-Site Dam / Liner and Seal Zone	3.2.01	Liner fails	Seepage of contaminated water to aquifer	O,D,P	VL	L	L	M			

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Table H-8 FMEA Table for Tailings Impoundments (Alternative 4 - Off-Site Proposed)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT PHASE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Impoundment / Main body (Tailings and Pond)	3.1.10	Tailings consolidation	Release of contaminated water to seepage collection system	O,D,P	M	L	H	M			
Off-Site Impoundment / Closure Cap	3.4.10	Tailings liquefaction	Disturbs cap	D,P	L	L	L	M	Place fluid on cap	VL	M
	3.4.11	Shrinkage of clay cap	Enhanced oxygen diffusion, ARD generation	O,D,P	H	L	L	M	Place flexible cap	M	M

Table H-9 FMEA Table for Ancillary Systems (Alternative 4 - Off-Site Proposed)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT PHASE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Ancillary Systems / Temporary Waste Rock Stockpile and Sedimentation Pond	5.1.01	Pile fails	Increase in sediment loading to Fisher Creek	O	Same as for Alternative 3						
	5.1.02	Debris flow, avalanche	Increase in sediment loading to Fisher Creek	O	Same as for Alternative 3						
	5.1.03	Flood in excess of sedimentation design storm (10-year, 24-hour)	Transport of acidic water and waste rock	O	Same as for Alternative 3						
	5.1.04	Seepage collection system fails (e.g., over capacity)	Transport of acidic water to Fisher Creek	O	Same as for Alternative 3						
	5.1.05	Liner fails	Transport of ARD to Fisher Creek	O	Same as for Alternative 3						
Ancillary Systems / Temporary Cap Rock and Soil Stockpiles	5.1.06	Pile fails	Increase in sediment loading to Fisher Creek	O	Same as for Alternative 3						
	5.1.07	Debris flow, avalanche	Increase in sediment loading to Fisher Creek	O	Same as for Alternative 3						
	5.1.08	Failure of slash filters	Increase in sediment loading to Fisher Creek	O	Same as for Alternative 3						
Ancillary Systems / Truck Transport	5.3.01	Accident	Release of tailings to Fisher Creek	O	M	L	L	M			
Ancillary Systems / Water Reservoir	5.4.01	Dam fails	Release of water to Fisher Creek	O	VL	H	H	H			
	5.4.02	Pipeline breaks	Release of water to Fisher Creek	O	VL	VL	VL	H			

Table H-11 FMEA Table for Tailings Dam (Alternative 5 - Upper Fisher Creek Proposed)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONSEQUENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONSEQUENCE LEVEL
Dam (Final Stage) / Structural Fill Zone	2.1.01	Surface erosion of dam by rainfall, wind	Increased sediment load to streams over baseline	C,O,D,P	Same as for Alternative 3						
	2.1.02	Static instability	Release of tailings and water	O,D,P	Same as for Alternative 3						
	2.1.03	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	Same as for Alternative 3						
	2.1.04	Differential settlement	Release of tailings and water	C,O,D,P	Same as for Alternative 3						
	2.1.05	Poor water management	Overtopping of dam and release of tailings and water	O,D	Same as for Alternative 3						
	2.1.06	Avalanche	Release of tailings and water	O,D,P	M	H	H	M	Avalanche control	L	M
	2.1.07	Flood in excess of design flood	Release of tailings and water	P	Same as for Alternative 3						
	2.1.08	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 3						
Dam / Liner and Soil Zone	2.2.01	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,D,P	Same as for Alternative 3						
	2.2.02	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 3						
	2.2.03	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,D,P	Same as for Alternative 3						
	2.2.04	Soil zone/liner does not filter tailings	Piping of tailings through liner/soil zone forms sinkholes	O,D,P	Same as for Alternative 3						
	2.2.05	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	Same as for Alternative 3						
Dam / Pond Underdrain System	2.3.01	Pipe plugging increases head upstream of cutoff	Piping and dam failure	O,D	Same as for Alternative 3						
Dam / Blanket Underdrain	2.3.02	Coating/Plugging (ARD precipitation)	Uncontrolled seepage => dam failure	O,D,P	Same as for Alternative 3						
	2.3.03	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,D,P	Same as for Alternative 3						

Table H-13 FMEA Table for Tailings Impoundment (Alternative 5 - Upper Fisher Creek Proposed)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Impoundment / Main body (Tailings and Pond)	3.1.01	Drought	Desiccation of tailings, ARD generation and wind erosion	O	Same as for Alternative 3						
	3.1.02	Avalanche	Release of tailings	O	M	M	M	M	Monitoring, avalanche control	L	M
Impoundment / Liner	3.2.01	Uplift between drains	Detach and/or rupture liner, release tailings and water	O	Same as for Alternative 3						
	3.2.02	Material and construction defects (e.g., liner slippage, tears in liner)	Rupture of liner system and loss of tailings and water through liner	O	M	H	H	M	Monitoring, construction QA/QC	VL	M
	3.2.03	Chemical decomposition due to long term liner integrity	Rupture of liner	P	Same as for Alternative 3						
	3.2.04	Differential settlement of foundation	Rupture of liner and loss of tailings and water through liner	O,D,P	Same as for Alternative 3						
	3.2.05	Heavy loads	Loss of tailings and water through liner	O,D,P	Same as for Alternative 3						
Impoundment / Main Underdrain and Branch Underdrains	3.3.01	Pipe plugging increases head upstream of cutoff	Lifts and damages liner	O	Same as for Alternative 3						
	3.3.02	Pipe break due to chemical breakdown	Piping and dam failure	O	Same as for Alternative 3						
Impoundment / Underdrain Collection System (Tank, Pump, Pond)	3.3.03	Power failure	Release of water to natural drainage	O	Same as for Alternative 3						
	3.3.04	Freezing	Release of water to natural drainage	O	Same as for Alternative 3						
	3.3.05	Line break	Release of water to natural drainage	O	Same as for Alternative 3						
	3.3.06	Excess water to collection system	Release of water to natural drainage	O	Same as for Alternative 3						

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Table H-12 FMEA Table for Tailings Impoundment (Alternative 5 - Upper Fisher Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT PHASE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Impoundment / Closure Cap	3.4.01	Early mine shutdown	Lack of sufficient tailings mass in impoundment completely filled with water, i.e. no wetlands	D,P	Same as for Alternative 3						
	3.4.02	Final tailings configuration not amenable to designed cap	Impact on water balance, pond water quality	D,P	Same as for Alternative 3						
	3.4.03	Differential or large consolidations	Runoff channel cracks, pond forms behind dam	D,P	Same as for Alternative 3						
	3.4.05	Tailings liquefaction	Disrupts cap	D,P	L	M	M	M	Place thicker cap	V	[illegible]
	3.4.08	Exposed waste rock in impoundment	ARD generation	D,P	Same as for Alternative 3						
	3.4.10	Avalanche	Failure of cap, disruption of runoff channel	D,P	Same as for Alternative 3						
	3.4.11	Tailings become contaminated	Contaminated seepage water flows to Fisher Creek	D,P	L	V	V	M			
Impoundment / Closure Spillway	3.5.01	Debris buildup	Decrease in flow capacity	D,P	Same as for Alternative 3						
	3.5.02	Large flood	Overtopping of dam, erosion of lateral dykes	D,P	Same as for Alternative 3						
	3.5.03	Spillway degradation	Erosion of dam	P	L	[illegible]	[illegible]	M	Design, care and maintenance	VL	M

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Table II-13 **FMEA Table for Water Management Systems (Alternative 5 - Upper Fisher Creek Proposal)**

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Water Management / Temporary Diversion Channels	4.1.01	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dyke.	O,D	H	L	L	M	Monitoring, maintenance	L	H
	4.1.02	Sedimentation	Increase in bed load, Change in channel geometry	O,D	Same as for Alternative 2						
	4.1.04	Large flood when channel is plugged	Water flows through dam rockfill, causing erosion of toe of dam	O,D	H	H-E	H-E	M	Monitoring, maintenance	VL	H
	4.1.06	Sidecutting at outlet	Dyke erosion at downstream end and dam failure	O,D,P	Same as for Alternative 2						
	4.1.08	Avalanche	Breach of dam crest, release of tailings and water	O,D	M	H-E	H-E	M	Avalanche control	L	H
	4.1.09	Ice jamming of channel (glaciation)	Flooding	O,D,P	Same as for Alternative 3						
Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01	Plugging of pipeline	Decrease in flows to impoundment	O	Same as for Alternative 2						
	4.2.02	Power outage at water reclaim pump	Decrease in reclaim flows to mill	O	Same as for Alternative 2						
	4.2.03	Power outage at slurry pipeline pump	Failure to pump pyritic tailings uphill, build-up of tailings at mill site	O	Same as for Alternative 3						

Table H-16 FMEA Table for Tailings Dam (Alternative 6 - South Henderson Mountain Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Dam (Final Stage) / Structural Fill Zone	2.1.01-LP	Surface erosion of dam by rainfall, wind	Increased sediment load to streams over baseline	C,O,D,P	Same as for Alternative 2					VL	H
				P	L	L	L	M			
	2.1.02-LP	Static instability	Release of tailings and water	O,D,P	VL	M	M	M	Monitoring, design QA/QC	N	H
	2.1.03-LP	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	VL	H	H	M	Dam design, monitoring	VL	H
	2.1.04-LP	Differential settlement	Release of tailings and water	C,O,D,P	Same as for Alternative 2						
	2.1.05-LP	Poor water management	Overtopping of dam and release of tailings and water	O,D	L	M	M	H	Monitoring, good water management, emergency spillway	VL	H
	2.1.06-LP	Avalanche	Release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.07-LP	Flood in excess of design flood	Release of tailings and water	P	Same as for Alternative 2						
	2.1.08-LP	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 2						
Pyritic Dam (Final Stage) / Structural Fill Zone	2.1.01-P	Surface erosion of dam by rainfall, wind	Increased sediment load to streams over baseline	C,O,D,P	Same as for Alternative 2						
	2.1.02-P	Static instability	Release of tailings and water	O,D,P	VL	E	E	M	Monitoring, design QA/QC	N	H
	2.1.03-P	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	VL	E	E	M	Dam design, monitoring	VL	H
	2.1.04-P	Differential settlement	Release of tailings and water	C,O,D,P	Same as for Alternative 2						
	2.1.05-P	Poor water management	Overtopping of dam and release of tailings and water	O,D	Same as for Alternative 2						
	2.1.06-P	Major avalanche that covers tailings pond	Erosion of dam, release of tailings and water	O,D,P	VL	H-E	H-E	M	Long-term monitoring	VL	H
	2.1.07-P	Flood in excess of design flood	Release of tailings and water	P	Same as for Alternative 2						
	2.1.08-P	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 2						

Table H-16 FMEA Table for Tailings Dam (Alternative 6 - South Henderson Mountain Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Dam / Liner and Seal Zone	2.2.01-LP	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,D,P	Same as for Alternative 2				Buy out adjacent properties		
	2.2.02-LP	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 2				Buy out adjacent properties		
	2.2.03-LP	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,D	VL	M	M	M	Monitoring, draw down pond	VL	H
				P	VL	L	L	M		VL	H
	2.2.04-LP	Seal zone/liner does not filter tailings	Piping of tailings through liner/seal zone forms sinkhole	O,D	L	M	M	M	Design filter zone in dam	VL	H
				P	L	L	L	M		VL	H
	2.2.05-LP	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	L	M	M	M	Care and maintenance	VL	H
Pyritic Dam / Liner and Seal Zone	2.2.01-P	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,D,P	Same as for Alternative 2				Buy out adjacent properties		
	2.2.02-P	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 2				Buy out adjacent properties		
	2.2.03-P	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,D	VL	M	M	M	Monitoring, draw down pond	VL	H
				P	VL	L	L	M			
	2.2.04-P	Seal zone/liner does not filter tailings	Piping of tailings through liner/seal zone forms sinkhole	O,D	L	M	M	M	Design filter zone in dam	VL	H
				P	L	L	L	M		VL	H
	2.2.05-P	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	L	L	L	M	Care and maintenance	VL	M
	2.2.06	Liner fails	Seepage of contaminated water to aquifers	O,D,P	VL	M	M	M			

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Table II-16 FMEA Table for Tailings Dam (Alternative 6 - South Henderson Mountain Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low Pyritic Dam / Pond Underdrain System	2.3.01-LP	Pipe plugging increases head upstream of cutoff	Piping and dam failure	O,D	Same as for Alternative 2						
Pyritic Dam / Pond Underdrain System	2.3.01-P	Pipe plugging increases head upstream of cutoff	Piping and dam failure	O,D	Same as for Alternative 2						
Low-Pyritic Dam / Blanket Underdrain	2.3.02-LP	Sealing/Plugging (ARD precipitation)	Uncontrolled seepage and dam failure	O,D,F	Same as for Alternative 3						
	2.3.03-LP	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,D,F	Same as for Alternative 3					VL	H
Pyritic Dam / Blanket Underdrain	2.3.02-P	Sealing/Plugging (ARD precipitation)	Uncontrolled seepage and dam failure	O,D,F	Same as for Alternative 3						
	2.3.03-P	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,D,F	Same as for Alternative 3						

Table H-17 FMEA Table for Tailings Impoundment (Alternative 6 - South Henderson Mountain Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Impoundment / Main body (Tailings and Pond)	3.1.01-LP	Drought	Desiccation of tailings, ARD generation and wind erosion	O	Same as for Alternative 3						
	3.1.02-LP	Avalanche	Release of tailings	O	VL	L	L	M	Monitoring, maintenance	L	H
Pyritic Impoundment / Main body (Tailings and Pond)	3.1.01-P	Drought	Desiccation of tailings, ARD generation and wind erosion	O	Same as for Alternative 3						
	3.1.02-P	Avalanche	Release of tailings	O	VL	L	L	M	Monitoring, maintenance	L	H
Low-Pyritic Impoundment / Liner	3.2.01-LP	Uplift between drains	Disturb and/or rupture liner, release tailings and water	O	L	M	M	M	Design, construction QA/QC	VL	P
	3.2.02-LP	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner and loss of tailings and water through liner	O	L-M	M	M	M	Monitoring, construction QA/QC	VL	H
	3.2.03-LP	Chemical decomposition due to long term liner integrity	Rupture of liner	P	Same as for Alternative 3						
	3.2.05-LP	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner system	O,D,P	VL	M	M	M	Maintenance	VL	H
Pyritic Impoundment / Liner	3.2.01-P	Uplift between drains	Disturb and/or rupture liner, release tailings and water	O	L	H	H	M	Design, construction QA/QC	VL	H
	3.2.02-P	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner and loss of tailings and water through liner	O	Same as for Alternative 3					VL	M
	3.2.03-P	Chemical decomposition due to long term liner integrity	Rupture of liner	P	Same as for Alternative 3						
	3.2.05-P	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner system	O,D,P	VL	M	M	M	Maintenance	VL	M
Low-Pyritic Impoundment / Main Underdrain and Branch Underdrains	3.3.01-LP	Pipe plugging increases head upstream of cutoff	Lifts and damages liner system	O	VL	M	M	M	Monitoring, upstream pump/drain	VL	H
	3.3.02-LP	Pipes break due to chemical breakdown	Piping and dam failure	O	Same as for Alternative 3						
Pyritic Impoundment / Main Underdrain and Branch Underdrains	3.3.01-P	Pipe plugging increases head upstream of cutoff	Lifts and damages liner system	O	VL	M	M	M	Monitoring, upstream pump/drain	VL	H
	3.3.02-P	Pipes break due to chemical breakdown	Piping and dam failure	O	Same as for Alternative 3						

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Table H-17 FMEA Table for Tailings Impoundment (Alternative 6 - South Henderson Mountain Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Impoundment / Underdrain Collection System (Tank, Pump, Pond)	3.3.03-LP	Power failure	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.04-LP	Freezing	Release of water to natural drainage	O	L	L	L	M	Monitoring, QA/QC	VL	H
	3.3.05-LP	Low levels	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.06-LP	Excess water to collection system	Release of water to natural drainage	O	M	L	L	M	Monitoring	L	H
Pyritic Impoundment / Underdrain Collection System (Tank, Pump, Pond)	3.3.03-LP	Power failure	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.04-LP	Freezing	Release of water to natural drainage	O	L	L	L	M	Monitoring, QA/QC	VL	H
	3.3.05-LP	Low levels	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.06-LP	Excess water to collection system	Release of water to natural drainage	O	M	L	L	M	Monitoring	L	H
Low-Pyritic Impoundment / Closure Cap	3.4.02-LP	Final tailings configuration not amenable to designed cap	Impact on water balance, pond water quality	D,P	L	M	M	M	Place tailings by barge, dry placement of tailings	VL	H
	3.4.03-LP	Tailings liquefaction	Disturbs cap	D,P	L	M	M	M	Place thicker cap	VL	H
	3.4.10-LP	Avalanche	Failure of cap, disruption of runoff channel	D,P	VL	L	L	M	Design cover to withstand avalanche	VL	H

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Table H-17 FMEA Table for Tailings Impoundment (Alternative 6 - South Henderson Mountain Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Pyritic Impoundment / Closure Cap	3.4.01.P	[illegible]	Lack of sufficient tailings beach to impoundment completely filled with water, i.e., no wetlands	D,P	L	L	L	M			
	3.4.02.P	Final tailings configuration not amenable to designed cap	Impact on water balance, pond water quality	D,P	L	M	M	H	Place tailings by barge, dry placement of tailings	VL	M
	3.4.03.P	Differential or large consolidation	Runoff channel sinks, tailings [illegible]	D,P	L	M	M	H	Long-term maintenance and monitoring, acceleration of slimes dewatering and consolidation	VL	H
	3.4.04.P	Differential or large consolidation	Plant stress	D,P	Same as for Alternative 3						
	3.4.05.P	Tailings liquefaction	Disturbs cap	D,P	L	M	M	M	Place thicker cap	VL	M
	3.4.06.P	Drought	Tailings become unsaturated and ARD generation occurs	D,P	Same as for Alternative 3						
	3.4.07.P	Drought	Loss of vegetation, erosion of top soil	D,P	Same as for Alternative 3						
	3.4.08.P	Exposed waste rock in impoundment	ARD generation	D,P	Same as for Alternative 3						
	3.4.09.P	Tree roots	Failure of soil cap	P	Same as for Alternative 3						
	3.4.10.P	Avalanche	Failure of cap, disruption of runoff channel	D,P	VL	L	L	M	Design cover to withstand avalanche	VL	H
Low-Pyritic Impoundment / Closure Spillway	3.5.01.LP	Spillway failure	Decrease in flow capacity	D,P	Same as for Alternative 3					VL	H
	3.5.02.LP	Large flood	Overtopping of dam, erosion of lateral dykes	D,P	VL	H	H	M	Emergency spillway at downstream end, care and maintenance	VL	H
Pyritic Impoundment/ Closure Spillway and Runoff Channel	3.5.01.P	Spillway failure	Overtopping of dam, erosion of lateral dykes	D,P	VL	H-E	H-E	M	Emergency spillway at downstream end, care and maintenance	VL	M

Table II-18 FMEA Table for Water Management Systems (Alternative 6 - South Henderson Mountain)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyrite Water Management / Permanent Diversion Channel	4.1.01-LP	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dyke	O,D	Same as for Alternative 2						
	4.1.02-LP	Sedimentation	Increase in bed load, Change in channel geometry	O,D,P	L	L	L	H	Monitoring, rock trap	L	H
	4.1.04-LP	Large flood when channel is plugged	Water flows through dam rockfill, causing erosion of toe of dam	O,D	VL	H	H	M	Monitoring, maintenance	VL	H
				P	L	M	M	M	Riprap dyke	VL	M
	4.1.05-LP	Sidecutting at diversion inlet	Dyke erosion at upstream end, release of pond water	O,D,P	Same as for Alternative 2					VL	H
	4.1.06-LP	Sidecutting at outlet	Dyke erosion at downstream end and dam failure	O,D,P	VL	H	H	M	Monitoring, maintenance	VL	H
	4.1.07-LP	Snow, avalanche	Decrease in flow capacity and flooding	O,D,P	VL	M	M	H			
	4.1.08-LP	Avalanche	Breach of dam crest, release of tailings and water	O,D,P	Same as for Alternative 2						
	4.1.09-LP	Ice jamming of channel (glaciation)	Flooding	O,D,P	Same as for Alternative 2					VL	H
	4.1.10-LP	Tree/organic debris build up due to beaver, etc.	Damming of channel	P	L	L	L	H	Continuous monitoring at least biennially, design channel with wider floodplain	VL	H
	4.1.11-LP	Water table rises in lateral dyke	Breaks liner	C,O	Same as for Alternative 2					VL	H

Table II-18 FMEA Table for Water Management Systems (Alternative 6 - South Henderson Mountain)

COMPONENT / SUB-COMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Pyritic Water Management / Permanent Diversion Channel and Stilling Basin	4.1.01-P	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dyke	O,D	Same as for Alternative 2						
	4.1.02-P	Sedimentation	Increase in bed load, change in channel geometry	O,D,P	L	L	L	H	Monitoring, rock trap	L	H
	4.1.04-P	Large flood when channel is plugged	Water flows through dam rockfill, causing erosion of toe of dam	O,D	Same as for Alternative 2						
				P	L	H	H	M		VL	M
	4.1.05-P	Sidecutting at diversion inlet	Dyke erosion at upstream end, release of pond water	O,D,P	Same as for Alternative 2					VL	H
	4.1.06-P	Sidecutting at outlet	Dyke erosion at downstream end and dam failure	O,D,P	Same as for Alternative 2					VL	H
	4.1.07-P	Snow, avalanche	Decrease in flow capacity and flooding	O,D,P	VL	M	M	H			
	4.1.08-P	Avalanche	Breach of dam crest, release of tailings and water	O,D,P	VL	H	H	H			
	4.1.09-P	Ice jamming of channel (glaciation)	Flooding	O,D,P	Same as for Alternative 2					VL	H
	4.1.10-P	Tree/organic debris build up due to beaver, etc.	Damming of channel	P	L	L	L	H	Continuous monitoring at least biennially, design channel with wider floodplain	VL	H
	4.1.11-P	Water table rises in lateral dyke	Breaks liner	C,O	Same as for Alternative 2						
Low-Pyritic Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01-LP	Pipeline break	Decrease in flows to impoundment	O	VL	L	L	H	Monitoring instrumentation, maintenance	L	H
	4.2.02-LP	Power outage at water reclaim pump	Decrease in reclaim flows to mill	O	Same as for Alternative 2						
Pyritic Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01-P	Pipeline break	Decrease in flows to impoundment	O	L	L	L	H	Monitoring instrumentation, maintenance	L	H
	4.2.02-P	Power outage at water reclaim pump	Decrease in reclaim flows to mill	O	Same as for Alternative 2						

Table H-21 FMEA Table for Tailings Dam (Alternative 7 - South Henderson Mountain w/Off-site Pyritic Tailings Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Dam (Final Stage) / Structural Fill Zone	2.1.01-LP	Surface erosion of dam by rainfall, wind with sediment traps	Increased sediment load to streams over baseline	C,O,D	M	L	L	H			
				P	M	L	L	M	Care and maintenance	VL	M
	2.1.02-LP	Static instability	Release of tailings and water	O,D,P	VL	M	M	M	Monitoring, design QA/QC	N	H
	2.1.03-LP	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	VL	H	H	M	Dam design, monitoring	VL	H
	2.1.04-LP	Differential settlement	Release of tailings and water	C,O,D,P	Same as for Alternative 2						
	2.1.05-LP	Poor water management	Overtopping of dam and release of tailings and water	O,D	L	H	H	H	Monitoring, good water management, emergency spillway	VL	H
	2.1.06-LP	Avalanche	Release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.07-LP	Flood in excess of design flood	Release of tailings and water	P	VL	M	M	M	On-going PMP/PMF studies, emergency spillway	VL	H
	2.1.08-LP	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 2						
Off-Site Dam (Final Stage) / Structural Fill Zone	2.1.01-OS	Surface erosion of dam by rainfall, wind	Increased sediment load to streams over baseline	C,O,D,P	Same as for Alternative 2						
	2.1.02-OS	Static instability	Release of tailings and water	O,D,P	VL	E	E	M	Monitoring, design QA/QC	N	H
	2.1.03-OS	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	VL	E	E	M	Dam design, monitoring	VH	H
	2.1.04-OS	Differential settlement	Release of tailings and water	C,O,D,P	Same as for Alternative 2						
	2.1.05 - OS	Poor water management	Overtopping of dam and release of tailings and water	O,D	Same as for Alternative 2						
	2.1.06 - OS	Avalanche	Release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.07 - OS	Flood in excess of design flood	Release of tailings and water	P	Same as for Alternative 2						
	2.1.08 - OS	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 2						

Table H-21 FMEA Table for Tailings Dam (Alternative 7 - South Henderson Mountain w/Off-site Pyritic Tailings Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Dam / Liner and Seal Zone	2.2.01 - LP	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,D,P	Same as for Alternative 2						
	2.2.02 - LP	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 2						
	2.2.03 - LP	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,D	VL	L	L	M	Monitoring, draw down pond	VL	H
				P	VL	L	L	M		VL	H
	2.2.04 - LP	Seal zone/liner does not filter tailings	Piping of tailings through liner/seal zone forms sinkhole	O,D	L	M	M	M	Design filter zone in dam	VL	H
				P	L	L	L	M			
	2.2.05 - LP	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	L	L	L	M	Care and maintenance	VL	H
Off-Site Dam / Liner and Seal Zone	2.2.01 - OS	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,D,P	Same as for Alternative 2						
	2.2.02 - OS	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 2						
	2.2.03 - OS	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,D,P	VL	L	L	M	Monitoring, drawdown pond	VL	H
	2.2.04 - OS	Seal zone/liner does not filter tailings	Piping of tailings through liner/seal zone forms sinkhole	O,D,P	L	M	M	M	Design filter zone in dam	VL	H
	2.2.05 - OS	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	L	M	M	M	Cut down trees on regular basis	VL	H
	2.2.06-OS	Liner fails	Seepage of contaminated water to aquifer	O,D,P	VL	L	L	M			
Low-Pyritic Dam / Pond Underdrain System	2.3.01	Pipe plugging increases head upstream of cutoff	Piping and dam failure	O,D	Same as for Alternative 2						
Low-Pyritic Dam / Blanket Underdrain	2.3.02	Scaling/Plugging (ARD precipitation)	Uncontrolled seepage and dam failure	O,D,P	Same as for Alternative 2						
	2.3.03	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,D,P	Same as for Alternative 2						

Table H-22 FMEA Table for Tailings Impoundment (Alternative 7 - South Henderson Mountain w/Off-Site Pyritic Tailings Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Impoundment / Main body (Tailings and Pond)	3.1.01-LP	Drought	Desaturation of tailings, ARD generation and wind erosion	O	Same as for Alternative 2						
	3.1.02-LP	Avalanche	Release of tailings	O	VL	L	L	M	Monitoring, maintenance	VL	H
Low-Pyritic Impoundment / Liner	3.2.01-LP	Uplift between drains	Disturb and/or rupture liner, release tailings and water	O	L	M	M	M	Monitoring, construction QA/QC	VL	H
	3.2.02-LP	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner and loss of tailings and water through liner	O	L-M	M	M	M	Monitoring, construction QA/QC	VL	H
	3.2.03-LP	Chemical decomposition due to long term liner integrity	Rupture of liner	P	Same as for Alternative 2						
	3.2.05-LP	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner	P	VL	M	M	M	Design for no liner	VL	H
Off-Site Impoundment / Liner	3.2.01-OS	Uplift between drains	Disturb and/or rupture liner, release tailings and water	O	L	H	H	M	Monitoring, construction QA/QC	VL	H
	3.2.02-OS	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner and loss of tailings and water through liner	O	L-M	H	H	M	Monitoring, construction QA/QC	VL	
	3.2.03-OS	Chemical decomposition due to long term liner integrity	Rupture of liner	P	Same as for Alternative 2						
	3.2.04-OS	Differential settlement of foundation	Rupture of liner and loss of tailings and water through liner	O,D,P	L	L	L	M	Monitoring	VL	H
	3.2.05-OS	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner	P	VL	M	M	M	Design for no liner	VL	H
Low-Pyritic Impoundment / Main Underdrain and Branch Underdrains	3.3.01-LP	Pipe plugging increases head upstream of cutoff	Lifts and damages liner	O	VL	M	M	M	Monitoring, upstream pump/drain	VL	H
	3.3.02-LP	Pipe break due to chemical breakdown	Piping and dam failure	O	Same as for Alternative 2						
Low-Pyritic Impoundment / Underdrain Collection System (Tank, Pump, Pond)	3.3.03-LP	Power failure	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.04-LP	Freezing	Release of water to natural drainage	O	L	L	L	M	Monitoring, QA/QC	VL	H
	3.3.05-LP	Line break	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.06-LP	Excess water to collection system	Release of water to natural drainage	O	M	L	L	M	Monitoring	L	H

Table H-22 FMEA Table for Tailings Impoundment (Alternative 7 - South Henderson Mountain w/Off-Site Pyritic Tailings Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Impoundment / Closure Cap	3.4.02-LP	Final tailings configuration not amenable to designed cap	Impact on water balance, pond water quality	D,P	L	M	M	H	Place tailings by barge, dry placement of tailings	VL	H
	3.4.03-LP	Tailings liquefaction	Disturbs cap	D,P	L	M	M	M	Place thicker cap	VL	H
	3.4.08-LP	Exposed waste rock in impoundment	ARD generation	D,P	Same as for Alternative 3						
	3.4.10-LP	Avalanche	Failure of cap, disruption of runoff channel	D,P	VL	L	L	M	Design cover to withstand avalanche	VL	H
	3.4.11-LP	Tailings become unsaturated	Contaminated seepage water flows to Fisher Creek	D,P	L	L	L	M	Place thicker cap	VL	H
Off-Site Impoundment / Closure Cap	3.4.03-OS	Tailings consolidation	ARD seepage	D,P	L	L	L	M	Place thicker cap	VL	H
	3.4.11-OS	Shrinkage of clay cap	Enhanced oxygen diffusion, ARD generation	O,D,P	H	L	L	M		M	M
Low-Pyritic Impoundment / Closure Spillway	3.5.01-LP	Debris buildup	Decrease in flow capacity	D,P	Same as for Alternative 3						
	3.5.02-LP	Large flood	Overtopping of dam, erosion of lateral dikes	D,P	VL	H	H	M	Emergency spillway at downstream end	VL	H

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Table H-23 FMEA Table for Water Management Systems (Alternative 7 - South Henderson Mountain w/Off-site Pyritic Tailings Disposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Water Management / Permanent Diversion Channel	4.1.01-LP	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dike	O,D	Same as for Alternative 3						
	4.1.03-LP	Sedimentation	Increase in bed load, Change in channel geometry	O,D,P	L	L	L	M	Monitoring, rock trap	VL	H
	4.1.04-LP	Large flood when channel is plugged	Possible erosion of toe of dam	O,D,P	VL	M	M	M		VL	H
	4.1.05-LP	Undercutting at diversion inlet	Dike erosion at upstream end, release of pond water	O,D,P	Same as for Alternative 3					VL	H
	4.1.06-LP	Undercutting at outlet	Dike erosion at downstream end and dam failure	O,D,P	VL	H	H	M	Monitoring, maintenance	VL	H
	4.1.07-LP	Snow, avalanche	Decrease in flow capacity and flooding	O,D,P	VL	M	M	H			
	4.1.08-LP	Avalanche	Breach of dam crest, release of tailings and water	O,D,P	Same as for Alternative 3						
	4.1.09-LP	Ice jamming of channel (glaciation)	Flooding	O,D,P	Same as for Alternative 3					VL	H
	4.1.10-LP	Tree/organic debris build up due to beaver, etc.	Damming of channel	P	L	L	L	H	Continuous monitoring at least biannually, design channel with wide floodplain	VL	H
	4.1.11-LP	Water table rises in lateral dike	[illegible]	C,O	Same as for Alternative 3						
Low-Pyritic Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01-LP	Pipeline break	Decrease in flows to impoundment	O	VL	L	L	H	Monitoring instrumentation, maintenance	L	H
	4.2.02-LP	Power outage at water reclaim pump	Decrease in reclaim flows to mill	O	Same as for Alternative 3						

Table H-24 FMEA Table for Ancillary Systems (Alternative 7 - South Henderson Mountain w/Off-site Pyritic Tailings Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Ancillary Systems / Temporary Waste Rock Stockpile and Sedimentation Pond	5.1.01	Pile fails	Increase in sediment loading to Fisher Creek	O	Same as for Alternative 2						
	5.1.02	Debris flow, avalanche	Increase in sediment loading to Fisher Creek	O	Same as for Alternative 2						
	5.1.03	Flood in excess of sedimentation design storm (10-year, 24-hour)	Transport of acidic water and waste rock	O	Same as for Alternative 2						
	5.1.04	Seepage collection system fails (e.g., over capacity)	Transport of acidic water to Fisher Creek	O	Same as for Alternative 2						
	5.1.05	Liner fails	Transport of ARD to Fisher Creek	O	Same as for Alternative 2						
Ancillary Systems / Temporary Cap Rock and Soil Stockpiles	5.1.06	Pile fails	Increase in sediment loading to Fisher Creek	O	Same as for Alternative 2						
	5.1.07	Debris flow, avalanche	Increase in sediment loading to Fisher Creek	O	Same as for Alternative 2						
	5.1.08	Failure of slash filters	Increase in sediment loading to Fisher Creek	O	Same as for Alternative 2						
Ancillary Systems / Truck Transport	5.3.01	Truck Accident	Release of tailings	O	L	M	M	M			

Table H-26 FMEA Table for Tailings Dam (Alternative 8 - Lulu Pass/Daisy Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Dam (Final Stage) / Structural Fill Zone	2.1.01-LP	Surface erosion of dam by rainfall, wind	Increased sediment load to stream over loading	C,O,D,P	Same as for Alternative 2					VL	H
	2.1.02-LP	Static instability	Release of tailings and water	O,D,P	VL	M	M	M	Monitoring, design QA/QC	N	H
	2.1.03-LP	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	VL	M	M	M	Dam design, monitoring	VL	H
	2.1.05-LP	Poor water management	Overtopping of dam and release of tailings and water	O,D	M	M	M	M	Monitoring, good water management, emergency spillway	L	M
	2.1.06-LP	Major avalanche that covers tailings pond	Erosion of dam, release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.07-LP	Flood in excess of design flood	Release of tailings and water	P	Same as for Alternative 2						
	2.1.08-LP	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 2						
Pyritic Dam (Final Stage) / Structural Fill Zone	2.1.01-P	Surface erosion of dam by rainfall, wind	Increased sediment load to stream over loading	C,O,D,P	Same as for Alternative 2					VL	M
	2.1.02-P	Static instability	Release of tailings and water	O,D,P	VL	E	E	M	Monitoring, design QA/QC	N	H
	2.1.03-P	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	VL	E	E	M	Dam design, monitoring	VL	H
	2.1.04-P	Differential settlement	Release of tailings and water	C,O,D,P	Same as for Alternative 2						
	2.1.05-P	Poor water management	Overtopping of dam and release of tailings and water	O,D	M	E	E	M	Monitoring, good water management, emergency spillway	L	M
	2.1.06-P	Avalanche	Release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.07-P	Flood in excess of design flood	Release of tailings and water	P	Same as for Alternative 2						
	2.1.08-P	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 2						
Low-Pyritic Dam / Liner and Seal Zone	2.2.01-LP	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,D,P	Same as for Alternative 2						
	2.2.02-LP	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 2						
	2.2.03-LP	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,D	VL	M	M	M	Monitoring, draw down pond	VL	H
				P	VL	L	L	M			
	2.2.04-LP	Seal zone/liner does not filter tailings	Piping of tailings through liner/seal zone forms sinkhole	O,D	VL	M	M	M	Design filter zone in dam	VL	H
				P	VL	L	L	M			
	2.2.05-LP	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	L	L	L	M	Care and maintenance	VL	H

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Table H-26 FMEA Table for Tailings Dam (Alternative 8 - Lulu Pass/Daisy Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Pyritic Dam / Liner and Seal Zone	2.2.01-P	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,D,P	Same as for Alternative 2						
	2.2.02-P	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 2						
	2.2.03-P	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,D	VL	M	M	M	Monitoring, draw down pond	VL	H
				P	VL	L	L	M			
	2.2.04-P	Seal zone/liner does not filter tailings	Piping of tailings through liner/seal zone forms sinkhole	O,D	VL	M	M	M	Design filter zone in dam	VL	H
				P	VL	L	L	M		VL	H
	2.2.05-P	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	L	L	L	M	Care and maintenance	VL	M
Low-Pyritic Dam / Pond Underdrain System	2.3.01-LP	Pipe plugging increases head upstream of cutoff	Piping and dam failure	O,D	Same as for Alternative 2						
Pyritic Dam / Pond Underdrain System	2.3.01-P	Pipe plugging increases head upstream of cutoff	Piping and dam failure	O,D	Same as for Alternative 2						
Low-Pyritic Dam / Blanket Underdrain	2.3.02-LP	Scaling/Plugging (ARD precipitation)	Uncontrolled seepage and dam failure	O,D,P	Same as for Alternative 2						
	2.3.03-LP	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,D,P	Same as for Alternative 2					VL	H
Pyritic Dam / Blanket Underdrain	2.3.02-P	Scaling/Plugging (ARD precipitation)	Uncontrolled seepage and dam failure	O,D,P	Same as for Alternative 2						
	2.3.03-P	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,D,P	Same as for Alternative 2						

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Table II-27 FMEA Table for Tailings Impoundment (Alternative 8 - Lake Pass/Daisy Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Impoundment / Main body (Tailings and Pond)	3.1.01-LP	Drought	Desaturation of tailings, ARD generation and wind erosion	O	Same as for Alternative 2						
	3.1.02-LP	Avalanche	Release of tailings	O	Same as for Alternative 2						
Pyritic Impoundment / Main body (Tailings and Pond)	3.1.01-P	Drought	Desaturation of tailings, ARD generation and wind erosion	O	Same as for Alternative 2						
	3.1.02-P	Avalanche	Release of tailings	O	Same as for Alternative 2						
Low-Pyritic Impoundment / Liner	3.2.01-LP	Uplift between drains	Disturb and/or rupture liner, release tailings and water	O	L	M	M	H	Design, construction QA/QC	VL	H
	3.2.02-LP	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner system and loss of tailings and water through liner	O	L-M	M	M	M	Monitoring, construction QA/QC	VL	M
	3.2.03-LP	Chemical decomposition due to long term liner integrity	Rupture of liner	P	Same as for Alternative 2						
	3.2.04-LP	Differential settlement of foundation	Rupture of liner and loss of tailings and water through liner	O,D,P	L	L	L	H	Design	VL	H
	3.2.05-LP	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner	P	Same as for Alternative 2						
Pyritic Impoundment / Liner	3.2.01-P	Uplift between drains	Disturb and/or rupture liner, release tailings and water	O	L	H	H	H	Design, construction QA/QC	VL	H
	3.2.02-P	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner and loss of tailings and water through liner	O	Same as for Alternative 2						
	3.2.03-P	Chemical decomposition due to long term liner integrity	Rupture of liner	P	Same as for Alternative 2						
	3.2.04-P	Differential settlement of foundation	Rupture of liner and loss of tailings and water through liner	O,D,P	L	M	M	H	Design	VL	H
	3.2.05-P	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner	P	Same as for Alternative 6					VL	M

Table II-27 FMEA Table for Tailings Impoundment (Alternative 8 - Lulu Pass/Daisy Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Impoundment / Main Underdrain and Branch Underdrains	3.3.01-LP	Pipe plugging increases head upstream of cutoff	Lifts and damages liner system	O	VL	M	M	M	Monitoring, upstream pump/drain	VL	H
	3.3.02-LP	Pipe break due to chemical breakdown	Piping and dam failure	O	Same as for Alternative 2						
Pyritic Impoundment / Main Underdrain and Branch Underdrains	3.3.01-P	Pipe plugging increases head upstream of cutoff	Lifts and damages liner system	O	VL	M	M	M	Monitoring, upstream pump/drain	VL	H
	3.3.02-P	Pipe break due to chemical breakdown	Piping and dam failure	O	Same as for Alternative 2						
Low-Pyritic Impoundment / Underdrain Collection System (Tank, Pump, Pond)	3.3.03-LP	Power failure	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.04-LP	Freezing	Release of water to natural drainage	O	L	L	L	M	Monitoring, QA/QC	VL	H
	3.3.05-LP	Line break	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.06-LP	Excess water to collection system	Release of water to natural drainage	O	M	L	L	M	Monitoring	L	H
Pyritic Impoundment / Underdrain Collection System (Tank, Pump, Pond)	3.3.03-P	Power failure	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.04-P	Freezing	Release of water to natural drainage	O	L	L	L	M	Monitoring, QA/QC	VL	H
	3.3.05-P	Line break	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.06-P	Excess water to collection system	Release of water to natural drainage	O	M	L	L	M	Monitoring	L	H
Low-Pyritic Impoundment / Closure Cap	3.4.02-LP	Final tailings configuration not amenable to designed cap	Impact on water balance, pond water quality	C/P	L	M	M	M	Place tailings by barge, dry placement of tailings	VL	H
	3.4.05-LP	Tailings liquefaction	Disturbs cap	C/P	L	M	M	M	Place thicker cap	VL	H
	3.4.10-LP	Avalanche	Failure of cap, disruption of runoff channel	C/P	L	L	L	M	Design cover to withstand avalanche	VL	H
	3.4.11-LP	Tailings become unsaturated	Contaminated seepage water	C/P	L	L	L	M	Place thicker cap	VL	H

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Table II-27 FMEA Table for Tailings Impoundment (Alternative 8 - Lake Pass/Daisy Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Pyritic Impoundment / Closure Cap	3.4.01-P	Early mine shutdown	Lack of sufficient tailings leads to impoundment completely filled with water, i.e., no wetlands	D,P	L	L	L	M			
	3.4.02-P	Final tailings configuration not amenable to designed cap	Impact on water balance, pond water quality	D,P	L	M	M	H	Place tailings by barge, dry placement of tailings	VL	M
	3.4.03-P	Differential or large consolidation	Runoff channel sinks, tailings cover	D,P	L	M	M	H	Long-term maintenance and monitoring, acceleration of slimes dewatering and consolidation	VL	M
	3.4.04-P	Differential or large consolidation	Plant stress	D,P	Same as for Alternative 3						
	3.4.05-P	Tailings liquefaction	Disturbs cap	D,P	L	M	M	M	Place thicker cap	VL	M
	3.4.06-P	Drought	Tailings become unsaturated and ARD generation occurs	D,P	Same as for Alternative 3						
	3.4.07-P	Drought	Loss of vegetation, erosion of top soil	D,P	Same as for Alternative 3						
	3.4.08-P	Exposed waste rock in impoundment	ARD generation	D,P	Same as for Alternative 3						
	3.4.09-P	Tree roots	Failure of soil cap	P	Same as for Alternative 3						
	3.4.10-P	Avalanche	Failure of cap, disruption of runoff channel	D,P	L	L	L	M	Design cover to withstand avalanche	VL	H
Low-Pyritic Impoundment / Closure Spillway	3.3.01-LP	Debris buildup	Decrease in flow capacity	D,P	Same as for Alternative 3					VL	H
	3.3.02-LP	Large flood	Overtopping of dam, erosion of lateral dikes	D,P	VL	H	H	M	Emergency spillway at downstream end, care and maintenance	VL	H
Pyritic Impoundment / Closure Spillway and Runoff Channel	3.5.01-P	Debris buildup	Decrease in flow capacity	D,P	Same as for Alternative 3					VL	M
	3.5.02-P	Large flood - spillway blockage	Overtopping of dam	D,P	L	H-E	H-E	M	Emergency spillway at downstream end, care and maintenance	L	M

Table H-28 FMEA Table for Water Management Systems (Alternative 8 - Lake Pass/Daisy Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Lake Pass Water Management / Permanent Diversion Channel	4.1.01.LP	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dyke	O,D	Same as for Alternative 1					VL	H
	4.1.02.LP	Sedimentation	Increase in bed load, Change in channel geometry	O,D,P	L	L	L	H	Monitoring, rock trap	L	H
	4.1.04.LP	Large flood when channel is plugged	Water flows through dam rockfill, causing erosion of toe of dam	O,D	VL	H	H	M	Monitoring, maintenance	VL	H
				P	L	H	H	M	Riprap dyke	VL	H
	4.1.05.LP	Undercutting at diversion inlet	Dyke erosion at upstream end, release of pond water	O,D,P	Same as for Alternative 1					VL	H
	4.1.06.LP	Undercutting at outlet	Dyke erosion at downstream end and dam failure	O,D,P	VL	H	H	M	Monitoring, maintenance	VL	H
	4.1.07.LP	Snow, avalanche	Decrease in flow capacity and flooding	O,D,P	VL	M	M	H			
	4.1.08.LP	Avalanche	Breach of dam crest, release of tailings and water	O,D,P	Same as for Alternative 1						
	4.1.09.LP	Ice jamming of channel (glaciation)	Flooding	O,D	Same as for Alternative 1					VL	M
	4.1.10.LP	Uncontrolled debris build up due to beaver, etc.	Damming of channel	P	L	L	L	H	Continuous monitoring at least biannually, design channel with wider floodplain	VL	H

Table II-28 FMEA Table for Water Management Systems (Alternative 8 - Lake Pass/Duley Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Pyritic Water Management / Permanent Diversion Channel and Stilling Basin	4.1.01-P	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dyke	O,D	Same as for Alternative 3						
	4.1.02-P	Sedimentation	Increase in bed load, Change in channel geometry	O,D,P	L	L	L	H	Monitoring, rock trap	L	H
	4.1.04-P	Large flood when channel is plugged	Water flows through dam rockfill, causing erosion of toe of dam	O,D,P	Same as for Alternative 3					VL	M
	4.1.05-P	Sidecutting at diversion inlet	Dyke erosion at upstream end, release of pond water	O,D,P	Same as for Alternative 3					VL	H
	4.1.06-P	Sidecutting at outlet	Dyke erosion at downstream end and dam failure	O,D,P	Same as for Alternative 3					VL	M
	4.1.07-P	Snow, avalanche	Decrease in flow capacity and flooding	O,D,P	VL	M	M	H			
	4.1.08-P	Avalanche	Breach of dam crest, release of tailings and water	O,D,P	VL	H	H	H			
	4.1.09-P	Ice jamming of channel (glaciation)	Flooding	O,D,P	Same as for Alternative 3					VL	M
	4.1.10-P	Tree/organic debris build up due to beaver, etc.	Damming of channel	P	L	L	L	H	Continuous monitoring at least biennially, design channel with wider floodplain	VL	H
Low-Pyritic Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01-LP	Pipeline break	Decrease in flows to impoundment	O	VL	L	L	H	Monitoring instrumentation, maintenance	L	H
	4.2.02-LP	Power outage at water reclaim pump	Decrease in reclaim flows to mill	O	Same as for Alternative 3						
	4.2.03-LP	Power outage at slurry pipeline pump	Failure to pump pyritic tailings uphill, build-up of tailings at mill site	O	H	L	L	M	Back-up power source, dump sumps along pipeline	L	H
Pyritic Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01-P	Pipeline break	Decrease in flows to impoundment	O	L	L	L	H	Monitoring instrumentation, maintenance	L	H
	4.2.02-P	Power outage at water reclaim pump	Decrease in reclaim flows to mill	O	Same as for Alternative 3						
	4.2.03-P	Power outage at slurry pipeline pump	Failure to pump pyritic tailings uphill, build-up of tailings at mill site	O	H	L	L	M	Back-up power source, dump sumps along pipeline	L	H

Table H-29 FMEA Table for Ancillary Systems (Alternative 5 - Lake Pass/Daisy Creek Mill Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Ancillary Systems / Temporary Waste Rock Stockpile and Sedimentation Pond	5.1.01	Pile fails	Increase in sediment loading to Daisy Creek	C,O	Same as for Alternative 2						
	5.1.02	Debris flow, avalanche	Increase in sediment loading to Daisy Creek	C,O	H	M	M	H	Monitoring, maintenance	VL	H
	5.1.03	Flood in excess of sedimentation design storm (10-year, 24-hour)	Transport of acidic water and waste rock	C,O	Same as for Alternative 2						
	5.1.04	Seepage collection system fails (e.g., over capacity)	Transport of acidic water to Daisy Creek	C,O	Same as for Alternative 2						
	5.1.05	Liner fails	Transport of ARD to Daisy Creek	C,O	Same as for Alternative 2						
Ancillary Systems / Temporary Cap Rock and Soil Stockpiles	5.1.06	Pile fails	Increase in sediment loading to Daisy Creek	O	Same as for Alternative 2						
	5.1.07	Debris flow, avalanche	Increase in sediment loading to Daisy Creek	O	H	L	L	H	Monitoring, maintenance	VL	H
	5.1.08	Failure of slash filters	Increase in sediment loading to Daisy Creek	O	Same as for Alternative 2						
Ancillary Systems / Mine Access Road	5.4.01	Avalanche	Restricts access	C,O	M	N	N	M	Work camp on site	L	H

Table H-31 FMEA Table for Tailings Dam (Alternative 9 - Lulu Pass/Fisher Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyritic Dam (Final Stage) / Structural Fill Zone	2.1.01-LP	Surface erosion of dam by rainfall, wind	Increased sediment load to streams over loading	C,O,D,P	Same as for Alternative 2					VL	H
	2.1.02-LP	Static instability	Release of tailings and water	O,D,P	VL	M	M	M	Monitoring, design QA/QC	N	H
	2.1.03-LP	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	VL	M	M	M	Dam design, monitoring	VL	H
	2.1.05-LP	Poor water management	Overtopping of dam and release of tailings and water	O,D	M	M	M	M	Monitoring, good water management, emergency spillway	L	M
	2.1.06-LP	Major avalanche that covers tailings pond	Erosion of dam, release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.07-LP	Flood in excess of design flood	Release of tailings and water	P	Same as for Alternative 2						
	2.1.08-LP	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 2						
Pyritic Dam (Final Stage) / Structural Fill Zone	2.1.01-P	Surface erosion of dam by rainfall, wind	Increased sediment load to streams over loading	C,O,D,P	Same as for Alternative 2					VL	M
	2.1.02-P	Static instability	Release of tailings and water	O,D,P	VL	E	E	M	Monitoring, design QA/QC	N	H
	2.1.03-P	Seismic deformation, liquefaction	Release of tailings and water	O,D,P	VL	E	E	M	Dam design, monitoring	VL	H
	2.1.04-P	Differential settlement	Release of tailings and water	C,O,D,P	Same as for Alternative 2						
	2.1.05-P	Poor water management	Overtopping of dam and release of tailings and water	O,D	M	E	E	M	Monitoring, good water management, emergency spillway	L	M
	2.1.06-P	Avalanche	Release of tailings and water	O,D,P	Same as for Alternative 2						
	2.1.07-P	Flood in excess of design flood	Release of tailings and water	P	Same as for Alternative 3						
	2.1.08-P	Vandalism	Destruction of dam	C,O,D,P	Same as for Alternative 2						
Low-Pyritic Dam / Liner and Seal Zone	2.2.01-LP	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,D,P	Same as for Alternative 3						
	2.2.02-LP	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 3						
	2.2.03-LP	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,D	VL	M	M	M	Monitoring, draw down pond	VL	H
				P	VL	L	L	M			
	2.2.04-LP	Seal zone/liner does not filter tailings	Piping of tailings through liner/seal zone forms sinkhole	O,D	VL	M	M	M	Design filter zone in dam	VL	H
				P	VL	L	L	M			
	2.2.05-LP	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	L	L	L	M	Care and maintenance	VL	H

Table H-31 FMEA Table for Tailings Dam (Alternative 9 - Lulu Pass/Fisher Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Pyritic Dam / Liner and Seal Zone	2.2.01-P	Rupture of lining due to material and/or construction defects leading to increased gradient	Enhanced groundwater seepage	O,D,P	Same as for Alternative 3						
	2.2.02-P	Integrity of HDPE liner degrades over long term	Enhanced groundwater seepage	P	Same as for Alternative 3						
	2.2.03-P	Amended soil liner does not function as a low-permeability layer	Contaminated seepage water	O,D	VL	M	M	M	Monitoring, draw down pond	VL	H
				P	VL	L	L	M			
	2.2.04-P	Seal zone/liner does not filter tailings	Piping of tailings through liner/seal zone forms sinkhole	O,D	VL	M	M	M	Design filter zone in dam	VL	H
				P	VL	L	L	M		VL	H
	2.2.05-P	Animal attack or plant/tree roots jeopardize integrity of liner	Deep burrowing or tree roots create channel for piping	P	L	L	L	M	Care and maintenance	VL	M
Low-Pyritic Dam / Pond Underdrain System	2.3.01-LP	Pipe plugging increases head upstream of cutoff	Piping and dam failure	O,D	Same as for Alternative 3						
Pyritic Dam / Pond Underdrain System	2.3.01-P	Pipe plugging increases head upstream of cutoff	Piping and dam failure	O,D	Same as for Alternative 3						
Pyritic Dam / Blanket Underdrain	2.3.02-LP	Sealing/Plugging (ARD precipitation)	Uncontrolled seepage and dam failure	O,D,P	Same as for Alternative 3						
	2.3.03-LP	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,D,P	Same as for Alternative 3					VL	H
Low-Pyritic Dam / Blanket Underdrain	2.3.02-P	Sealing/Plugging (ARD precipitation)	Uncontrolled seepage and dam failure	O,D,P	Same as for Alternative 3						
	2.3.03-P	Damage to filter fabric and upward hydraulic gradients through foundation soils	Piping	O,D,P	Same as for Alternative 3						

Table H-32 FMEA Table for Tailings Impoundment (Alternative 9 - Lulu Pass/Fisher Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONSEQUENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONSEQUENCE LEVEL
Low-Pyritic Impoundment / Main body (Tailings and Pond)	3.1.01-LP	Drought	Desiccation of tailings, ARD generation and wind erosion	O	Same as for Alternative 3						
	3.1.02-LP	Avalanche	Release of tailings	O	Same as for Alternative 3						
Pyritic Impoundment / Main body (Tailings and Pond)	3.1.01-P	Drought	Desiccation of tailings, ARD generation and wind erosion	O	Same as for Alternative 3						
	3.1.02-P	Avalanche	Release of tailings	O	Same as for Alternative 3						
Low-Pyritic Impoundment / Liner	3.2.01-LP	Uplift between drains	Disturb and/or rupture liner, release tailings and water	O	L	M	M	H	Design, construction QA/QC	VL	H
	3.2.02-LP	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner system and loss of tailings and water through liner	O	L-M	M	M	M	Monitoring, construction QA/QC	VL	M
	3.2.03-LP	Chemical decomposition due to long term liner integrity	Rupture of liner	P	Same as for Alternative 3						
	3.2.04-LP	Differential settlement of foundation	Rupture of liner and loss of tailings and water through liner	O,D,P	L	L	L	H	Design	VL	H
	3.2.05-LP	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner	P	Same as for Alternative 3						
Pyritic Impoundment / Liner	3.2.01-P	Uplift between drains	Disturb and/or rupture liner, release tailings and water	O	L	H	H	H	Design, construction QA/QC	VL	H
	3.2.02-P	Material and construction defects (e.g., liner slippage, poor connection between Stage 1 and Stage 2 liners, tears in liner)	Rupture of liner and loss of tailings and water through liner	O	Same as for Alternative 3						
	3.2.03-P	Chemical decomposition due to long term liner integrity	Rupture of liner	P	Same as for Alternative 3						
	3.2.04-P	Differential settlement of foundation	Rupture of liner and loss of tailings and water through liner	O,D,P	L	M	M	H	Design	VL	H
	3.2.05-P	Heavy loads due to machinery, avalanche, snow, high water level	Loss of tailings and water through liner	P	Same as for Alternative 6					VL	M
Low-Pyritic Impoundment / Main Underdrain and Branch Underdrains	3.3.01-LP	Pipe plugging increases head upstream of cutoff	Lifts and damages liner system	O	VL	M	M	M	Monitoring, upstream pumpback	VL	H
	3.3.02-LP	Pipe break due to chemical breakdown	Piping and dam failure	O	Same as for Alternative 3						
Pyritic Impoundment / Main Underdrain and Branch Underdrains	3.3.01-P	Pipe plugging increases head upstream of cutoff	Lifts and damages liner system	O	VL	M	M	M	Monitoring, upstream pumpback	VL	H
	3.3.02-P	Pipe break due to chemical breakdown	Piping and dam failure	O	Same as for Alternative 3						

Table II-32 FMEA Table for Tailings Impoundment (Alternative 9 - Lulu Pass/Fisher Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES WATER QUALITY	CONSEQUENCES AQUATIC LIFE	CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION LIKELIHOOD CATEGORY	POST-COMPENSATION CONFIDENCE LEVEL
Low Pyritic Impoundment / Underdrain Collection System (Tank, Pump, Feed)	3.3.03-LP	Power failure	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.04-LP	Freezing	Release of water to natural drainage	O	L	L	L	M	Monitoring, QA/QC	VL	H
	3.3.05-LP	Line break	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.06-LP	Excess water to collection system	Release of water to natural drainage	O	M	L	L	M	Monitoring	L	H
Pyritic Impoundment / Underdrain Collection System (Tank, Pump, Feed)	3.3.03-LP	Power failure	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.04-LP	Freezing	Release of water to natural drainage	O	L	L	L	M	Monitoring, QA/QC	VL	H
	3.3.05-LP	Line break	Release of water to natural drainage	O	M	L	L	M	Monitoring, QA/QC	VL	H
	3.3.06-LP	Excess water to collection system	Release of water to natural drainage	O	M	L	L	M	Monitoring	L	H
Low-Pyritic Impoundment / Closure Cap	3.4.02-LP	Final tailings configuration not amenable to designed cap	Impact on water balance, pond water quality	D,P	L	M	M	M	Place tailings by barge, dry placement of tailings	VL	H
	3.4.03-LP	Tailings liquefaction	Disturbs cap	D,P	L	M	M	M	Place thicker cap	VL	H
	3.4.10-LP	Avalanche	Failure of cap, disruption of runoff channel	D,P	L	L	L	M	Design cover to withstand avalanche	VL	H
	3.4.11-LP	Tailings become unsaturated	Contaminated seepage water flows to Soda Butte Creek	D,P	L	L	L	M	Place thicker cap		

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Table H-32 FMEA Table for Tailings Impoundment (Alternative 9 - Lulu Pass/Fisher Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Pyritic Impoundment / Closure Cap	3.4.01.P	Early mine shutdown	Lack of sufficient tailings leads to impoundment completely filled with water, i.e., no wetlands	D,P	L	L	L	M			
	3.4.02.P	Final tailings configuration not amenable to designed cap	Impact on water balance, pond water quality	D,P	L	M	M	H	Place tailings by barge, dry placement of tailings	VL	M
	3.4.03.P	Differential or large consolidation	Runoff channel sinks, tailings cover	D,P	L	M	M	H	Long-term maintenance and monitoring, acceleration of slimes dewatering and consolidation	VL	M
	3.4.04.P	Differential or large consolidation	Plant stress	D,P	Same as for Alternative 3						
	3.4.05.P	Tailings liquefaction	Disturbs cap	D,P	L	M	M	M	Place thicker cap	VL	M
	3.4.06.P	Drought	Tailings become unsaturated and ARD generation occurs	D,P	Same as for Alternative 3						
	3.4.07.P	Drought	Loss of vegetation, erosion of top soil	D,P	Same as for Alternative 3						
	3.4.08.P	Exposed waste rock in impoundment	ARD generation	D,P	Same as for Alternative 3						
	3.4.09.P	Tree roots	Failure of soil cap	P	Same as for Alternative 3						
	3.4.10.P	Avalanche	Failure of cap, disruption of runoff channel	D,P	L	L	L	M	Design cover to withstand avalanche	VL	H
Low-Pyritic Impoundment / Closure Spillway	3.5.01.LP	Debris buildup	Decrease in flow capacity	D,P	Same as for Alternative 3						
	3.5.02.LP	Large flood	Overtopping of dam, erosion of lateral dikes	D,P	VL	H	H	M	Emergency spillway at downstream end, care and maintenance	VL	H
Pyritic Impoundment / Closure Spillway and Runoff Channel	3.5.01.P	Debris buildup	Decrease in flow capacity	D,P	Same as for Alternative 3					VL	M
	3.5.02.P	Large flood - spillway blockage	Overtopping of dam, erosion of lateral dikes	D,P	L	H,E	H,E	M	Emergency spillway at downstream end, care and maintenance	L	M

Table II-33 FMEA Table for Water Management Systems (Alternative 9 - Lulu Pass/Fisher Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Low-Pyrite Water Management / Permanent Diversion Channel	4.1.01-LP	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dyke	O,D	Same as for Alternative 3					VL	H
	4.1.02-LP	Sedimentation	Increase in bed load, Change in channel geometry	O,D,P	L	L	L	H	Monitoring, rock trap	L	H
	4.1.04-LP	Large flood when channel is plugged	Water flows through dam rockfill, causing erosion of toe of dam	O,D	VL	H	H	M	Monitoring, maintenance	VL	H
				P	L	H	H	M	Riprap dyke	VL	H
	4.1.05-LP	Sidecutting at diversion inlet	Dyke erosion at upstream end, release of pond water	O,D,P	Same as for Alternative 3					VL	H
	4.1.06-LP	Sidecutting at outlet	Dyke erosion at downstream end and dam failure	O,D,P	VL	H	H	M	Monitoring, maintenance	VL	H
	4.1.07-LP	Snow, avalanche	Decrease in flow capacity and flooding	O,D,P	VL	M	M	H			
	4.1.08-LP	Avalanche	Breach of dam crest, release of tailings and water	O,D,P	Same as for Alternative 3						
	4.1.09-LP	Ice jamming of channel (glaciation)	Flooding	O,D	Same as for Alternative 3					VL	M
	4.1.10-LP	Tree/organic debris build up due to beaver, etc.	Damming of channel	P	L	L	L	H	Continuous monitoring at least biennially, design channel with wider floodplain	VL	H
	4.1.11-LP	Water table rises in lateral dyke	Breaks liner	C,O	Same as for Alternative 3					VL	H

Table H-23 FMEA Table for Water Management Systems (Alternative 9 - Lake Pass/Fisher Creek Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Pyritic Water Management / Permanent Diversion Channel and Stilling Basin	4.1.01-P	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dyke	O,D	Same as for Alternative 2						
	4.1.02-P	Sedimentation	Increase in bed load, Change in channel geometry	O,D,P	L	L	L	H	Monitoring, rock trap	L	H
	4.1.04-P	Large flood when channel is plugged	Water flows through dam rockfill, causing erosion of toe of dam	O,D,P	Same as for Alternative 2					VL	M
	4.1.05-P	Sidecutting at diversion inlet	Dyke erosion at upstream end, release of pond water	O,D,P	Same as for Alternative 2					VL	H
	4.1.06-P	Sidecutting at outlet	Dyke erosion at downstream end and dam failure	O,D,P	Same as for Alternative 2					VL	M
	4.1.07-P	Snow, avalanche	Decrease in flow capacity and flooding	O,D,P	VL	M	M	H			
	4.1.08-P	Avalanche	Breach of dam crest, release of tailings and water	O,D,P	VL	H	H	H			
	4.1.09-P	Ice jamming of channel (glaciation)	Flooding	O,D	Same as for Alternative 2					VL	M
	4.1.10-P	Tree/organic debris build up due to beavers, etc.	Damming of channel	P	L	L	L	H	Continuous monitoring at least biennially, design channel with wider floodplain	VL	H
	4.1.11-P	Water table rises in lateral dyke	Breaks liner	C,O	Same as for Alternative 2						
Low-Pyritic Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01-LP	Pipeline break	Decrease in flows to impoundment	O	VL	L	L	H	Monitoring instrumentation, maintenance	L	H
	4.2.02-LP	Power outage at water reclaim pump	Decrease in reclaim flows to mill	O	Same as for Alternative 2						
	4.2.03-LP	Power outage at slurry pipeline pump	Failure to pump pyritic tailings uphill, build-up of tailings at mill site	O	H	L	L	M	Back up power source, dump sumps along pipeline	L	H
Pyritic Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01-P	Pipeline break	Decrease in flows to impoundment	O	L	L	L	H	Monitoring instrumentation, maintenance	L	H
	4.2.02-P	Power outage at water reclaim pump	Decrease in reclaim flows to mill	O	Same as for Alternative 2						
	4.2.03-P	Power outage at slurry pipeline pump	Failure to pump pyritic tailings uphill, build-up of tailings at mill site	O	H	L	L	M	Back up power source, dump sumps along pipeline	L	H

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Table H-34 FMEA Table for Ancillary Systems (Alternative 9 - Lulu Pass/Fisher Creek Mill Proposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Ancillary Systems / Temporary Waste Rock Stockpile and Sedimentation Pond	5.1.01	Pile fails	Increase in sediment loading to Daisy Creek	C,O	Same as for Alternative 2						
	5.1.02	Debris flow, avalanche	Increase in sediment loading to Daisy Creek	C,O	H	M	M	H	Monitoring, maintenance	VL	H
	5.1.03	Flood in excess of sedimentation design storm (10-year, 24-hour)	Transport of acidic water and waste rock	C,O	Same as for Alternative 2						
	5.1.04	Seepage collection system fails (e.g., over capacity)	Transport of acidic water to Daisy Creek	C,O	Same as for Alternative 2						
	5.1.05	Liner fails	Transport of ARD to Daisy Creek	C,O	Same as for Alternative 2						
Ancillary Systems / Temporary Cap Rock and Soil Stockpiles	5.1.06	Pile fails	Increase in sediment loading to Daisy Creek	O	Same as for Alternative 2						
	5.1.07	Debris flow, avalanche	Increase in sediment loading to Daisy Creek	O	H	L	L	H	Monitoring, maintenance	VL	H
	5.1.08	Failure of slash filters	Increase in sediment loading to Daisy Creek	O	Same as for Alternative 2						
Ancillary Systems / Mine Access Road	5.4.01	Avalanche	Restricts access	C,O	H	L	L	M	Work camp on site	M	M

Table H-25 FMEA for New World Underground Mine (Alternative 10 - South Henderson Mountain, Dry Tailings Deposit)

COMPONENT	ID	FAILURE MODE OR POTENTIAL PROBLEM	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES			CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUANTITY	WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Miller Creek Deposit	1.1.01	Groundwater previously moving to Miller Creek discharges into the mine	Reduction in Miller Creek baseflow	C,O	H	M	-	-	M	Augmented streamflow to Miller Creek, control of blasting to reduce fracturing	L	M
				D,P	H	L	-	-	M	Augmented streamflow to Miller Creek	L	M
	1.1.02		Degradation of water quality	O	L	-	M	L*	M			
				D,P	M	-	M	L*	M	Treat and release	VL	M
	1.1.03	Major (unexpected) structures or mine rock has higher hydraulic conductivity than expected	Lower water table over mine, sulphide oxidation**	C	M	L	H	H	M	Selective grouting of transmissive features in advance of mine	VL	M
				O,D,P	M	L	M	L*	M	Selective grouting of transmissive features, plug adit	VL	M
	1.1.04	Blasting	Elevated ammonia and nitrate in groundwater	O	VL	-	M	L*	M			
				D	M	-	M	L*	H	Monitor for nitrogen	L	M
				P	VL	-	L	L*	H			
Homestake Deposit	1.2.01	Groundwater previously moving to Fisher Creek discharges into the mine	Reduction in Fisher Creek baseflow	C,O	M	L-M	-	-	H	Augment streamflow	L	M
				D	H	M	-	-	M	Augment streamflow	L	M
				P	H	L	-	-	M	Augmented streamflow to Miller Creek	VL	H
	1.2.02		Degradation of water quality	O	L	-	M	M	M			
				D,P	M	-	M	M	M	Treat and release	VL	M
	1.2.03	Major (unexpected) structures or mine rock has higher hydraulic conductivity than expected	Lower water table over mine, sulphide oxidation	C	M	M	H	H	M	Selective grouting of transmissive features	VL	M
				O,D,P	M	M	M	M	M	Selective grouting of transmissive features	VL	M
	1.2.04	Blasting	Elevated ammonia and nitrate in groundwater	O	VL	-	M	M	M			
				D	M	-	M	M	H	Monitoring network to detect nitrogen compounds	L	M
				P	VL	-	L	L	H			
Adits and Portals	1.3.01	Failure of portal plugs	Loss of groundwater to adits, lowering of water table, decrease of discharge to Miller and Fisher Creeks and reduction of water quality in Upper Creeks	P	L	M	L-M	L-M	M	Backup "seal" plugs	VL	M
	1.3.02	Water table does not return to original state even with plug	Continued, long-term reduction in Miller/Fisher Creek baseflow	D	H	L	L	L	M	Backfill adits	L	M
				P	M-H	L	L	L	M	Backfill adits	L	M
Backfill: Coarse tailings and cement	1.4.01	Incomplete backfill	Subsidence or rockfall	O,D,P	L	M	L	L	L-M	Use paste and/or pelletized backfill	L	H
	1.4.02		Sulphide oxidation	O,D,P	M	L	M	M	L-M	Use paste and/or pelletized backfill	L	H
	1.4.03		Reduction of flow to Upper Miller Creek	O,D,P	M	M	L	L	L-M	Use paste and/or pelletized backfill	L	H

* No impact on fisheries (Miller Creek naturally devoid of fish), possible impact on invertebrates

** Incremental effects over 1.1.01 and 1.1.02

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Table H-34 FMEA Table for Tailings Dam (Alternative 10 - South Henderson Mountain, Dry Tailings Disposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Perimeter Dam	2.1.01	Surface erosion of dam by rainfall, with sediment control	Increased sediment load to streams and possible dam breach	C,O,D	M	L	L	H			
				P	M	M	M	M	Care and maintenance	VL	M
	2.1.02	Static instability	Release of tailings	O,D,P	L	M	M	M	Monitoring, design QA/QC, berm	H	H
	2.1.03	Seismic deformation, liquefaction	Release of tailings	O,D,P	L	M	M	M	Dam design, monitoring, berm	VL	H
	2.1.04	Differential settlement	Release of tailings and water	C,O,D,P	H	H	H	H			
	2.1.06	Major avalanche that covers tailings pond	Erosion of dam, release of tailings and water	O,D,P	VL	L	L	H			
	2.1.08	Vandalism	Destruction of dam	C,O,D,P	VL	L	L	M			
	2.1.09	Construction problems with snow	Weak layers in fill or mine [illegible] dam	O	M	M	M	M	Manage operations	L	M

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Table H-37 FMEA Table for Tailings Impoundment (Alternative 10 - South Henderson Mountain, Dry Tailings Disposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Liner System	3.2.01	Uplift of liner	Disturb and/or rupture liner system, release tailings and water	O	L	L	L	M	Install drains	VL	H
	3.2.02	Liner system fails	Leakage	O,D	L	L	VL	H	Compensation in adjacent [illegible]	VL	M
	3.2.03	Chemical decomposition due to long term liner integrity	Rupture of HDPE layer	P	L	VL	H	H	Design for no HDPE layer	VL	H
Impoundment / Main Underdrain and Bench Underdrains	3.3.01	Leachate collection system fails	Lose monitoring capability	O,D,P	L	VL	VL	H	Install monitoring wells	VL	H
Impoundment / Underdrain / Collection System (Tank, Pump, Pond)	3.3.03	Power failure	Release of contaminated water to natural drainage	O	M	L	L	H	[illegible], backup power source	VL	H
	3.3.04	Freezing	Release of contaminated water to natural drainage	O	M	L	L	H	Monitoring, QA/QC	VL	H
	3.3.05	Line break	Release of contaminated water to natural drainage	O	M	L	L	H	Monitoring, QA/QC	VL	H
	3.3.06	Excess water to collection system	Release of contaminated water to natural drainage	O	M	L	L	H	Monitoring	L	H
Impoundment / Closure Cap	3.4.03	Differential or large consolidations	Runoff channel sinks, pond forms behind berm	D,P	L	L	L	M		VL	M
	3.4.04	Oxidation of tailings	Plant stress	D,P	L	L	L	M	Vegetation plan	VL	M
	3.4.05	Tailings liquefaction	Disturbs cap	D,P	M	L	L	M	Place thicker cap	VL	M
	3.4.08	Exposed waste rock in impoundment	ARD generation	D,P	VL	M	M	M	Ensure burial	VL	H
	3.4.09	Tree roots	Failure of soil cap	P	L	L	L	M	Cut down trees on regular basis	VL	M
	3.4.10	Avalanche	Failure of cap, disruption of runoff channel	D,P	VL	L	L	H			

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Table H-28 FMEA Table for Water Management Systems (Alternative 10 - South Henderson Mountain, Dry Tailings Disposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Water Management / Permanent Diversion Channel and Stilling Basin	4.1.01	Debris flow	Lateral sediment loading, blockage of channel, erosion of lateral dyke	C,O,P	VL	L	L	H			
	4.1.02	Sedimentation	Increase in bed load, Change in channel geometry	C,O,P	VL	L	L	H			
	4.1.07	Snow, avalanche	Decrease in flow capacity and flooding	C,O,P	VL	L	L	H			
	4.1.09	Ice jamming of channel (glaciation)	Flooding	C,O,P	VL	L	L	H			
	4.1.10	Overtopping, debris build up due to beaver, etc.	Damming of channel	P	VL	L	L	H			
Water Management / Slurry Pipeline System (HDPE Pipe, Pump, Containment Channel)	4.2.01	Pipeline break	Spill of poor quality water to creek	O	M	M	M	M	Monitoring instrumentation, maintenance	L	H
	4.2.02	Power outage at water reclaim station	Decrease in reclaim flows to mill	O	H	N	N	M	Back-up power source	VL	H
Water Management / Sediment Collection Pond	4.3.01	Large flood exceeds capacity	Discharge of low quality water	O	L-M	L	L	M	Design system and back-up	VL	H

Table H-29 FMEA Table for Ancillary Systems (Alternative 10 - South Henderson Mountain, Dry Tailings Disposal)

COMPONENT / SUBCOMPONENT	ID	FAILURE MODE	EFFECTS	PROJECT STAGE	LIKELIHOOD CATEGORY	CONSEQUENCES		CONFIDENCE LEVEL	COMPENSATING FACTORS	POST-COMPENSATION	
						WATER QUALITY	AQUATIC LIFE			LIKELIHOOD CATEGORY	CONFIDENCE LEVEL
Ancillary Systems / Temporary Waste Rock Stockpile and Sedimentation Pond	5.1.01	Pile fails	Increase in sediment loading to Fisher Creek	C,O	M	M	M	M	Monitoring, maintenance	VL	H
	5.1.02	Debris flow, avalanche	Increase in sediment loading to Fisher Creek	C,O	L	L	L	M	Monitoring, maintenance	VL	H
	5.1.03	Flood in excess of sedimentation pond design storm (10-year, 24-hour)	Increase in sediment loading to Fisher Creek	C,O	H	L	L	M	Design for larger flood, treat runoff water	M	H
	5.1.04	Seepage collection system fails (i.e., pump, pipe...)	Transport of acidic water to Fisher Creek	C,O	M	L	L	M	Monitoring, maintenance, treat runoff water	L	H
	5.1.05	Liner fails	Transport of ARD to Fisher Creek	C,O	M	L	L	M	Monitoring, maintenance, treat runoff water	L	H
Ancillary Systems / Temporary Cap Rock and Soil Stockpiles	5.1.06	Pile fails	Increase in sediment loading to Fisher Creek	O	M	M	M	M	Monitoring, maintenance	VL	H
	5.1.07	Debris flow, avalanche	Increase in sediment loading to Fisher Creek	O	VL	L	L	M	Monitoring, maintenance	VL	H
	5.1.08	Failure of slash filters	Increase in sediment loading to Fisher Creek	O	L	L	L	M	Monitoring, maintenance	L	H
Ancillary Systems / Stream Crossings	5.2.01	Failure of stream crossing		O,D					Engineered stream crossing		

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APPENDIX I

PUBLIC COMMENT ON DRAFT EIS
AND
AGENCIES' RESPONSES

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INTRODUCTION

Appendix I presents the public comments received by the agencies (Bureau of Land Management and Forest Service) during the review period for the Draft EIS. (Agency and State and Local Government comments are presented in Chapter 4 of this document.) Following each comment - or grouping of like comments - the agencies provide a response that describes how the comment was addressed in the analysis process.

Where comments were nearly identical, or contained very similar points on one topic, they have been combined into one comment that is representative of that topic. All of the referenced letter numbers are included with each comment that is displayed.

Occasionally throughout the report there are comments that have been summarized by the agency and titled "Agencies Summary of Comments." This occurs only where there are many, or very long, comments on a particular topic, or where the topics being addressed in the comments are very complex.

Some of the comments received by the agencies were expressions of values or "votes" for a particular alternative, and provided no substantive information for the analysis. These comments did not require a response; however, they have been printed (some individually, some combined) to provide readers with an understanding of the convictions and values the public has shared with the agencies during this analysis process. All of the public comments have been valuable.

The substantive changes to the document are described at the beginning of each chapter of the EIS and throughout the resource discussions in Chapter 3. A number of commentors suggested editorial changes in the document, and these, too, have been considered and incorporated where appropriate.

The agencies wish to thank all of those who took time to share their thoughts with us. With the public's assistance, the agencies have made substantial improvements in the Final EIS.

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COMMENTORS

TABLE I-1 LIST OF THOSE WHO COMMENTED ON THE DRAFT EIS

LETTER#	NAME	LETTER #	NAME
300	Steve Hicks	324	John M. Good
301	Richard Lambert	325	Dave Wheelock
302	Park County MT Commissioners - Copy of fax to Bruce Babbit	326	James O. Southworth
303	Jack & Jane Braten	327	Jeanne Harper
304	Carolyn St. James	328	Susan Pendleton Mavor
305	Kenneth Naylor	329	Richard D. Anderson, MD
306	Bob Thompson	330	Mr. & Mrs. Elmer Drange
307	Carol Reeser	331	Fred Crisp
308	Frank Baner	332	Hope Stevens
309	Frederick J. Maxted III	333	Thomas J. Weitz
310	Ursula A. Selyem	334	Andrea Murray
311	Lois B. Nichol	335	Sara Toubman
312	Steve Jacoby	336	Tim & ? Leifer
313	Jim & Virginia Court, Action Travel	337	Mary McMahon
314	Nancy M. Schlobohm	338	Marilyn Dinger
315	Dr. Kathy Hansen	339	Marian Setter
316	Steven Evans	340	Clark Alexis
317	Montana Mining Association Jill Andrews	340	Lynette Joy Johnson
318	Victoria MacDonald	341	Gonnie Siebel
319	Robert Staffanson	342	Melissa Blackford
320	John Fontanz	343	State Historic Preservation Office Stan Wilmoth
321	Ward B. McCartney, III	344	Frederic & Beth Sammond
322	Jerry Schillinger	345	Mary Pelatt
323	Thomas K. Harding	346	Jeffery Hunnes

TABLE I-1 LIST OF THOSE WHO COMMENTED ON THE DRAFT EIS (cont.)

LETTER#	NAME	LETTER #	NAME
347	Joyce Johannsen	371	Chuck Neal
348	Mel & Barbara Horton	372	Wyoming Trout Unlimited
349	Paula Scheuring	373	ssr engineers
350	Andrew Bryson	374	Geocon, Inc
351	Louisa Willcox	375	Donald McCracken Jr.
352	Hobie Hare	376	Silas Counts
353	James A. Swaney	377	Joe Gutkoski MT River Action Network
354	William H. Funk III	378	Sharon Harvey
355	Natural Resources Defense Council, Johanna H. Wald	379	Kevin L. Martinez
356	Doris Milner	380	Tim Stevens
357	John Langstaff	381	Richard C. Parks Bear Creek Council
358	Wade Sikorski, Ph.D.	382	Marissa Godoy
359	Bruce Muhlbradt	383	Metallurgical Services Gordon F. Ziesing
360	Phyllis Wolfe	384	Loren Smith
361	Jennifer Delese	385	Park County Planning Dept
362	Farwell Smith	386	Lou A. Snodgrass
363	Ruth & Dave Grubler	387	Bernard G. Hurd Northwest Parts & Rigging
364	Dorothy & Clarence Stoltz	388	K. G. Thompson
365	Wayne & Pat Solberg	389	M. Ruth Nilswander
366	Alan Counts	390	The Leffingwell Guest & Cattle Ranch
367	Mary Brutgen	391	R. D. Clair
368	Mary Beth Marks, Ph.D	392	MT Bureau of Mines & Geology Robin McCulloch
369	Energy Laboratories, Inc.	393	Greater Yellowstone Flyfishers Chad Olson
370	Navratil, Unmack & Herring	394	Barbara Varnes

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TABLE I-1 LIST OF THOSE WHO COMMENTED ON THE DRAFT EIS (cont.)

LETTER#	NAME	LETTER #	NAME
395	Ester Carter	421	Marshall Dominick
396	Alan Counts	422	Lester & Marion Sunvison
397	Duplicate of letter 366	423	Hart Baiti
398	Pat Simmons	424	Steve Thomas
399	Joan Montagne	425	Wyoming Outdoor Council Caroline Byrd
400	Gordan & Helen Waller	426	Mary Dominick Chivers
401	Stephanie Cochrane & Ray Corbin	427	Valerie Hafner
402	Duplicate of 402	428	Dale Sexten
403	Cahill, Castle, Perreault, Christensen, & Kestner	429	Reid Collins
404	Emil & Rosetta	430	Void Number
405	Chan Libbey	431	Kathleen Crawfor, George Kahrl
406	Peter Aengst	432	Neel Miller
407	Steve Hicks	433	Ann Biastock
408	Sixty Three Ranch Sandra Cahill	434	Carlos Van Natter
409	Mary Fitzpatrick	435	Cliff Browne
410	Edith Woods	436	Duane Claypool
411	Thomas Dolese	437	Gary Boyer & Frank Meyers
412	Glen Gordan	438	Nellie Israel
413	Glen Hill	439	William Barmore Jr.
414	Andy Lindblad	440	7-D Ranch Spencer Dominick
415	Lisa Scharin	441	Wyoming Outdoor Council Caroline Byrd
416	Dick Ellis	442	Henry Dykema
417	Mr. & Mrs. Carman Consalo	443	James Denison
418	Jane Steffenhagen	444	Elizabeth Hartley
419	Fred & Katie Cady	445	Board of County Commissioners
420	Wesley Hamilton	446	K.R. Kiddoo

TABLE I-1 LIST OF THOSE WHO COMMENTED ON THE DRAFT EIS (cont.)

LETTER#	NAME	LETTER #	NAME
447	Corps of Engineers	475	Leland Kevu
448	Ruth Petranek	476	Judy Adams McHale
449	Rose Karbowski	477	William F & Joan Humiston
450	Elizabeth Scanlin	478	Doug Parker
451	Jeanne Hum	479	Cynthia Benson Gee
452	Edward Skillman	480	High Country Motel, Inc.
453	Alan Jones	481	Sierra Club Legal Defense Fund
454	Carolyn Toyer	482	Greg Sauer
455	Heidi C. Barrett	483	Debbie Lineweaver
456	Don Bachman	484	Jason Wilson
457	Don Wirth	485	Mike Whittington
458	Roseanne C. Bloom	486	Cooke City Store
459	Pan-O-Rama West, Inc Virginia Johnson	487	Andrew W. Lammers
460	Betty Rae Luckinbill	488	Minerals Exploration Coalition
461	Ral W. Hall	489	Allan R. Kirk
462	Dick Kragler	490	Cecelia Youngblood
463	Frederick & Clella House	491	YNP
464	Art & Shirley Bales	492	Philip J. Campbell
465	B. Gialdini	493	R. MacAlpine
466	David Gialdini	494	Montana Mining Assn
467	Gene & Beth Bowling	495	Ted Antonioli
468	Dave Courtis	496	George Ommundsen
469	Randy Powelson	497	Margaret Reeb
470	Joseph C. Icenogle	498	Rob Corkran
471	John & Joyce Sholz	499	Bruce E. Cox
472	Park County Multiple Use Assn.	500	Greater Yellowstone Coalition
473	U.S.G.S.	501	Montana Wilderness Association
474	WY Gov. Jim Geringer	502	Montana Chapter Sierra Club

TABLE I-1 LIST OF THOSE WHO COMMENTED ON THE DRAFT EIS (cont.)

LETTER#	NAME	LETTER #	NAME
503	Laura Redish	507	Randy Powelson
504	Nolan Smith	508	Bryan Wyberg
505	Crown Butte Mines, Inc.	509	John R. Swanson
506	Northwest Mining Association	510	Charles M. Hauptman

COMMENTS AND RESPONSES

CHAPTER 1 PURPOSE AND NEED FOR ACTION

BACKGROUND

Comment:

439 ...the DEIS should have pointed out that between the time that President Clinton announced the moratorium on August 25, 1995 and when the moratorium officially took affect on September 1, 1995, Crown Butte Mines, Inc., the developer of the proposed New World Mine staked 38 or 39 new claims in the study area. The DEIS should have indicated the acreage involved in these new claims. This disclosure of the action by Crown Butte mines is important because it indicates what could occur if the proposed mineral withdrawal is not implemented by August 31, 1997. Even more claims might be staked in order to further forestall future removal of the area from development of known hard rock minerals.

Agencies' Response:

Thirty-nine millsite claims were filed by Crown Butte Mines Inc., between the Presidential address and September 1, 1995, segregation notice. The 5-acre millsite claims cover 195 acres. A sentence has been added to the "BACKGROUND" section in Chapter 1 stating that the filing of additional mining claims is likely if the area re-opens to mineral entry.

GENERAL LOCATION AND GEOGRAPHIC SETTING

Comment:

439 Since the DEIS mentions that the study area is bordered on the west, north, and east by U.S. Forest Service (U.SFS) wilderness areas, the DEIS should also have mentioned that the National Park Service has recommended that the area in Yellowstone National Park adjacent to the study area on the east be designated as wilderness and added to the National Wilderness Preservation System, and that the area is being managed as wilderness until Congress and the President take action on the recommendation (U.S. National Park Service 1972).

Agencies' Response:

The recommendation on wilderness designation in Yellowstone National Park is included in the "Affected Environment" descriptors of the "Yellowstone National Park" and "Wilderness" sections in Chapter 3 of the Final EIS.

PURPOSE AND NEED

Comments:

301 The purpose and need statements for the DEIS are woefully inadequate. The narrow focus is based on many intangible needs and subjective analysis. The fact that the State of Montana has said that the proposed Crown Butte project would improve the water quality is not even mentioned in the analysis of Alternatives. The needs must include the needs of society, landholders, Montanans, and the U.S. trade deficit...

479 The "Purpose and Need" for this proposed mineral withdrawal has been initially described as stemming from President Clinton's "concern about the effects of mining on the area's outstanding natural resources". The obvious inconsistency in this "purpose" is that mineral deposits are outstanding natural resources. The laws and regulations of the U.S. already address multiple land use issues, one of which is extraction of natural resources, including minerals.

Agencies' Response:

According to Council on Environmental Policy regulations at 40 CFR 1502.13, "Purpose and Need;"

"The statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action."

The purpose and need for this project is to determine whether a mineral withdrawal is necessary to protect other area resources. Relevant issues identified through public input, such as economics and the effects on land use, serve as a basis for the effects analysis of alternatives considered in Chapter 3 of the EIS.

Comments:

504 Mining activity is not compatible with National Parks or Wilderness areas and are part of the criteria developed to exclude these areas from consideration. For the BLM to step in now after years of intense study and preclude for all time any mining activity in this area is absolutely ludicrous to your own charter.

507 How will the CCAMW help to achieve the mission statement for the United States Forest Service Minerals Program Policy?

Agencies' Response:

The mineral withdrawal, if approved by the Secretary of the Interior, is a change in policy and direction for management of these specific lands, rather than a violation or departure from Forest Plans and other laws and regulations.

The Forest Service Minerals Program Policy (8/3/95) and the 1995 Draft Resources Planning Act (RPA) Program establish policies, goals and objectives applicable to the Nation as a whole, not to specific areas. While the proposed mineral withdrawal of the Cooke City area would not advance the minerals goals contained in these documents, it certainly does not preclude achieving the goals on a national scale.

Comments:

Withdrawing 22,000 acres of public land from an area which is located in a historic mining district: (See # after comment)

-is unreasonable and unprecedented. **(Comment letters 317, 333, 423, 562, 504)**

-would be harmful to the future of the mining industry in Montana **(Comment letter 423)**

-[removes] land ...that is known to contain mineral deposits **(Comment letter 383)**

-[removes an] area that has historically been in the mining district with extensive mining **(Comment letter 384)**

-circumvents public law (e.g., the mine permitting process);...will impact Montana's economy, which is already on the verge of recession. **(Comment letter 383)**

-seriously damages the land management process defined by the National Environmental Policy Act. **(Comment letter 499)**

505 Unfortunately, the unwarranted use of the Secretary's withdrawal authority in these circumstances is likely to have a negative impact on mineral exploration and development far beyond the Cooke City area and the boundaries of Montana by declaring that the Secretary's withdrawal authority will be used to achieve political as well as environmental goals.

488 This proposed mineral withdrawal was politically motivated, was implemented in a highly political fashion, and is driven by the Administration's desire to cater to one special interest faction at the expense of several other sectors of the economy, including local business operators, local, state and regional government, and the mining industry.

478 The lack of attention to the implications of the proposed withdrawal to local land and mineral owners and of the potentially significant precedent of allowing political pandering to subjugate well established National land management policies and procedures is a serious flaw in the document.

478 The broader public policy implications of the withdrawal on private property rights, the sustainability of the US domestic mineral industry and the continued application of the NEPA process that allows activities on public land needs to be addressed in this document.

495 ...the DEIS creates a rationale to justify a political decision, rather than basing a conclusion on a fair, professional, and unbiased review of the facts. In this respect it is a very unusual DEIS, inverting the usual process, and creating an after-the-fact justification for political interference in what was an ongoing, and nearly complete, process of environmental review for the New World project. It sets a precedent for a system of "presidential review" of mine projects, since many or most large scale projects require various federal permits. ...[it] serves as a signal to prospectors that the acquiescence of high political figures will henceforth be required to carry a mine forward in the United States.

I want to express my alarm over Administration actions which short-circuit environmental review procedures, prejudge the outcome of ongoing studies, and set a disturbing precedent for improper political interference in the process of applying for a mine permit. The proposed withdrawal of lands from mineral entry is only one of several actions related to the New World project which, taken in sum, signal a far reaching and unhealthy shift in our nation's approach to the permitting of mines.

369 This action sets a dangerous precedent whereby areas available for mining and minerals exploration and production are determined bureaucratically rather than on the economic, environmental, and sociological criteria that are established and working elsewhere. We have rules for mine siting that deal with the appropriateness of the activity and its impacts. We should let these existing regulations determine if an area is suitable and the development plan is complete rather than basing the decision on a non-technical process.

Agencies' Summary of Comments:

The precedent setting nature of this action is of particular concern. The withdrawal may discourage development of mineral resources on other federal lands. The political interference with decisions concerning minerals management on federal lands establishes a disturbing precedent.

Agencies' Response:

A mineral withdrawal is a tool available to the Administration and land management agencies to withhold lands from mining to maintain other resource values in the area. Withdrawals are discretionary actions within the authority of the President and the Administration. Typically, land management agencies, rather than interested individuals or groups, are responsible for applying for mineral withdrawals. However, the President, as well as the Secretary of the Interior, have the administrative authority to propose mineral withdrawals. The Cooke City Area Mineral Withdrawal, as well as other administrative withdrawals, are applied to specific tracts of federal land. A withdrawal of more than 5,000 acres requires Congressional review.

Any future mineral withdrawal proposals must comply with withdrawal regulations at 43 CFR 2310, including environmental analysis required by the National Environmental Policy Act (NEPA). NEPA provides for public participation in this process.

Mineral withdrawals, as well as revocations, are not unprecedented. Withdrawals for several federal land management agencies for the period of 1991 through 1995 are summarized in Table I-2:

TABLE I-2 ACRES OF WITHDRAWALS AND REVOCATIONS FROM 1991-1995 FOR FEDERAL LAND MANAGEMENT AGENCIES

AGENCY	WITHDRAWAL (Acres)		REVOCATION (Acres)	
	5 yr Total	Annual Avg.	5 yr Total	Annual Avg.
Bureau of Land Management	355,627	71,125	328,708	65,742
U.S. Forest Service	121,626	24,325	2,505	501
U.S Fish & Wildlife Service	2,882,917	576,583	0	0
Totals	3,360,170		331,213	

Note: The above figures are compilations of withdrawals and revocations that were administratively made by the secretary of the Interior. Source: Public Land Statistics, USDI, BLM 1991-95.

Comment:

504 Part of the responsibility of the BLM is to provide for development of the minerals necessary for the advancement and security of our nation, and to help support local economies. If there is indeed a concern for the water quality in this headwaters area, then cleanup and mitigation should begin... If you are simply concerned with the potential of pollution from future mining, then you are assuming first that development will take place, and that substandard science and engineering methods will be used.

Agencies' Response:

The EIS does not assume that substandard science and engineering methods will be used. Even with "state of the art" science and engineering methods, mining-related risks to area resources remain. A "FAILURE MODES EFFECTS ANALYSIS" (Appendix H) has been added to help assess mining-related risks.

The Secretary of the Interior must balance the value of other resources in the area against the potential benefits and consequences of mining, considering mining-related risks to area resources.

Comments:

488 In 1978 when the Absaroka-Beartooth Wilderness Area was created by Act of Congress, the New World Mining district was specifically excluded from the wilderness area. **(Also comment letters 453, 459-466, 470, 497)**

303 When the surrounding area was declared Wilderness this portion was deliberately excluded because of the potential mineral content for mining. **(Also comment letter 504)**

457 The US Geological Survey recognized the importance of the mineralization of the area and that is why it was left open to mineral entry. These studies were conducted for the Beartooth Primitive Area in 1969-72 and also in 1978 for the A-B Wilderness Area.

505 ...the DEIS notably excludes any meaningful discussion of the policy that is inherent in Congress' decision to exclude the study area from the boundaries of Yellowstone National Park, the North Absaroka Wilderness and the Absaroka-Beartooth Wilderness. Because of the history of mining in the study area and the long-known presence of mineral resources, the fact that the boundaries of these statutorily protected areas were drawn specifically to exclude the study area reflects the Congressional decision that mineral development in this area was likely and acceptable. Congress has also repeatedly rejected legislation that would formalize a "buffer zone" around parks and wilderness areas, which is the practical, if unstated, effect of the proposed withdrawal. The DEIS fails to consider the implications of administratively reversing this long-standing policy.

Agencies' Response:

The House of Representatives Report on Designating the Absaroka-Beartooth Wilderness, Custer and Gallatin National Forests, in the State of Montana, (Report No. 95-927), stated: "Known and potential mineral values are a key resource in and near the proposed wilderness."

The New World district was listed as a high potential area for gold and copper. Mineralized areas deleted from the Bill included 800 acres in the vicinity of Independence Creek and portions of the West Fork of the Stillwater River. The study area, including the New World Mining District, was not considered for wilderness designation in either the Senate or House Bill. One hundred and fifty acres were excluded near Goose Lake to provide for a more definable boundary, and 1400 acres near Kersey Lake were excluded because of 160 acres of private land and to provide for snowmobile use.

Wilderness designation and mineral withdrawals are two separate and distinct actions with different intent and consequences. Wilderness is established by Congress to preserve areas in a wild and primitive state. Mineral withdrawals are implemented at the discretion of the Administration to withhold areas from mining in order to maintain other resource values present.

Congressional action that resulted in establishing the nearby Absaroka-Beartooth Wilderness did not preclude or restrict administrative actions such as the mineral withdrawal of the study area. A mineral withdrawal of non-wilderness lands does not result in future wilderness designation by Congress. Congress can review and, if so desired, terminate a mineral withdrawal with a concurrent resolution within 90 days after the Public Land Order is signed.

Comments:

488 No legal justification is presented for your statement "protection of surrounding wilderness areas, scenic integrity, recreational opportunities, cultural resources and wildlife from the effects of mining activity." The NEPA process was specifically enacted to assure the protection of these issues in any mine permitting process. We are sensitive to a need to provide a reasonable degree of protection for the adjacent area, but we believe your stated reason for the withdrawal is not justified by current law.

489 ... this EIS was necessitated by a charge from President Clinton with a stated purpose and need to protect water quality and fisheries. All of the other elements identified as benefits during scoping should not be used as the basis for expanding the "purpose and need" of the EIS to include each of these other elements. I am certain that these other elements have played significantly in both the alternatives identified, and analyzed, in the NEPA evaluation of this draft EIS. This is outside of the stated purpose, objectives and needs of the initial charge.

Agencies' Response:

The purpose of a mineral withdrawal is to withhold federal lands from entry under the mining law to maintain other public values in the area. Purposes may include quality of scientific, scenic, historical, ecological, environmental, air, water resources, archaeological values, or other special purposes (Forest Service Manual 2760). The primary purpose and need identified by President Clinton focused on water quality and freshwater fisheries.

The National Environmental Policy Act (NEPA) requires a public scoping process to determine issues and concerns the public may have regarding a proposed action (Forest Service Handbook 1909.15, Chap 10.3) Based on public scoping process for the withdrawal proposal, other resource values were identified and then included as part of the reasons for the withdrawal, consistent with Forest Service Manual direction cited above.

Comment:

489 In the 3rd paragraph of your Purpose and Need Section, you identify risks from mining related activities that have not been validated or studied in this EIS document. These are assumptions on your part and are inadequately studied, to date. They should not be used as a basis for determining the purpose, objectives, scope and need for this EIS.

Agencies' Response:

In an effort to better characterize mining-related risks, a summary of the "FAILURE MODES EFFECTS ANALYSIS" has been added to the Final EIS as Appendix H. Risks mentioned in the section referred to in this comment are "potential" risks. These risks are described in greater detail in the subsequent analysis under the description of environmental effects for the appropriate resource discussions presented in Chapter 3. The purpose and need is based on the potential effects or risks to area resources that could occur as a result of mining.

Comment:

507 If the mission statement for the United States Forest Service Minerals Program Policy, is to be achieved by reserving the minerals within the CCAMW for some future use, please state exactly what issues of protecting *"...water quality and fresh water fishery resources within the watersheds of Soda Butte Creek, Clarks Fork River, and Stillwater River from the effects of future hardrock mining activities that could occur on federal lands in the headwaters of these streams."* In what way will these issues be adequately addressed "In the future" that cannot be addressed today?

Agencies' Response:

The intent of a mineral withdrawal is not necessarily to reserve minerals for some future use. The Forest Service Minerals Policy program represents a national emphasis that does not apply to every area of the National Forest system. The purpose of this mineral withdrawal is to protect water quality and freshwater fisheries as well as other important resource values in the area. The withdrawal may be revoked at some future date, or not renewed at the end of the 20-year withdrawal period if the purpose and need for the withdrawal is no longer valid.

Comments:

303 Your study assumes mining will destroy the water quality, the fishery, the wetlands, the wildlife, the recreation and the whole area, when it is just as possible that with today's known technology and regulations, mining will produce better quality water than exists today.

369

507 Under current Federal and State law, are, "*water quality and fresh water fishery resources within the watersheds of Soda Butte Creek, Clarks Fork River, and Stillwater River [PROTECTED] from the effects of future hardrock mining activities that could occur on federal lands in the headwaters of these streams...*"

What "*effects of future hardrock mining activities that could occur on federal lands*" is the CCAMW intended to prevent, that is not already prohibited, regulated or addressed under current State and Federal environmental law?

Why is the CCAMW needed ... when Table 1-1, (Attachment #2) of the NWM PDEIS lists 33 permits, licenses or governmental approvals BEFORE a mine permit for a project such as the NWM may be issued?

Several sections of the CCAMW DEIS refer to a range of negative environmental impacts within the CCAMW area due to "HISTORIC" mining activities dating from 1863 through the 1960's. Are there Federal and State laws to prevent this type of environmental damage from occurring today?

506 ...the DEIS demonstrates that the major environmental objectives, protecting or improving water quality, can be met without a mineral withdrawal. Further, the DEIS indicates that under several likely scenarios the withdrawal will actually hamper the stated purpose of the withdrawal.

453 The technology is available to keep the waters cleaner than in the past... Any mining operation would have to conform to the [laws and] regulations of the many agencies looking out for America's environment/already in place. (**Also comment letters 422, 433, 404, 510, 497, 348, 459-466, 470, 492, 488**)

488 The DEIS analysis of the consequences of not implementing the withdrawal implicitly implies negative consequences from mining activity if it were to occur. Any mining which might occur in the New World Mining District, just as anywhere else in the United States, must comply with local, state and federal environmental law. (**Also comment letters 505, 506**)

392 As experienced by existing mining companies, dewatering is not a possibility. The baseline research establishes stream and spring flows. Should the mine eliminate that flow through operations, the volume must be made up through other means. Mines do not have infinite capability for storage. What water is not recycled, must be discharged to the natural system. Montana's Clean Water Act requires that water meets specified water quality standards which means the company may have to clean up *naturally degraded* water ***before*** returning it to the system.

505 The DEIS provides no evidence that water quality impacts from mining, under the current regulatory scheme in place in Montana, present even the risk of significant environmental harm. The decision, therefore, that the proposed withdrawal is necessary to protect regional water quality is not supported by the DEIS or the Department's own analysis.

Agencies' Summary of Comments:

Existing laws, regulations and technology are available to ensure protection of water quality and freshwater fisheries in area streams. Today's regulatory climate includes stringent standards (which any mine must meet) and a comprehensive approach by the agencies. The DEIS provides no evidence a withdrawal is necessary to protect water quality.

Agencies' Response:

Several respondents suggested that the water quality regulatory framework in both Montana and Wyoming is sufficient to protect water quality without a mineral withdrawal in the Cooke City area. The Environmental Effects section for "Surface Water Quality," Alternative A, Scenario A-1, describes a variety of water management techniques which could be used to mitigate ground water and surface water mining impacts including surface Best Management Practices (BMP's) for vegetation removal and road construction, managing surface runoff around mining facilities, sediment control structures, adit water treatment and discharge permits, ground water mitigation, and wetland mitigation/compensation. Facility and stormwater discharge is regulated by discharge permit requirements which must meet water quality standards and non-degradation requirements in both Wyoming and Montana.

A key issue in the withdrawal analysis is whether the water quality regulatory framework is sufficient to protect area streams and wetlands. Some respondents suggested that the current

water quality regulations are sufficient and a withdrawal is not necessary. The EPA and other respondents listed examples of recent mining water quality problems in Montana, the US, and in foreign countries where mining water quality mitigation was not sufficient or effective. There is no definitive answer to whether existing water quality standards, BMP's, and mining/water engineering techniques would be sufficient to protect water quality in the study area. The risk of additional water quality changes in the study area due to mining impacts would generally be reduced by a mineral withdrawal recognizing that some opportunities for mine-related water treatment would be reduced as well as would some potentially environmentally preferable sites for mine facilities.

A decision on a mineral withdrawal is not necessarily a statement about the adequacy of existing laws and regulations. Rather, it is a policy issue concerning the future land use in this area. Is mining an appropriate use of these federal lands given the other resource values present? The fact that projects may comply with existing laws and regulations is an important consideration but not the only deciding factor for any withdrawal decision.

The study area has high values for many resources, is adjacent to Yellowstone National Park and two Wilderness areas, and forms the headwaters of Outstanding Natural Resource Waters. The EIS describes the resources in this setting and considers how mining could effect these resources. The Secretary of the Interior must balance the value of resources in the area against the potential benefits and consequences of future mining, taking into account pertinent laws and regulations.

Comments:

505 As evidenced by the selection of the proposed withdrawal as the preferred alternative, the Department apparently plans to proceed with the withdrawal despite the analysis in the DEIS. This decision presents a variety of potential violations of the Federal Land Policy and Management Act ("FLPMA") and the federal Administrative Procedures Act ("APA"), for the record that has been developed by the Department fails to support the Department's proposed action. Without a complete justification for the proposed withdrawal, the Secretary will be violating his own regulations (and therefore, FLPMA). Because the withdrawal will not achieve its stated purpose, a decision to proceed with the withdrawal would violate the APA's directive against arbitrary and capricious agency action.

506 It is unfortunate that the Secretary of the Interior ...now appears ready to discount the findings of this DEIS.

Agencies' Response:

If the Secretary of the Interior decides to withdraw federal lands in the area, the justification for the withdrawal will be summarized in a "Record of Decision" for this project. The Secretary will consider the analysis in the EIS to support his decision, which could be "no withdrawal," a "partial withdrawal," or a "full withdrawal" of federal lands in the study area.

Comments:

505 The DEIS fails to demonstrate that the proposed withdrawal would effectively improve regional water quality or significantly benefit any other aspect of the environment. In fact, the evidence suggests that water quality improvements associated with abandoned mine reclamation would be stymied by such a withdrawal and that any mineral activities which did occur would be concentrated in a limited area, exacerbating any water quality impacts (or the risks of such impacts) which may occur from activities located on those lands.

... the DEIS demonstrates that the proposed withdrawal will have no discernible beneficial impact on regional water quality, will delay or discourage reclamation of historic mine sites and will not, therefore, accomplish the stated purpose of the withdrawal.

It appears that, where data was not readily available, the Department made no effort to gather data. In fact, it appears that no data gathering or analysis was done specifically for this DEIS, instead all of the analysis was borrowed from other documents or studies. NEPA requires that federal agencies undertake reasonable efforts to gather missing data. 43 C.F.R. 1502.22 (a). Surely, where an agency proposed an action for the primary purpose of protecting water quality, NEPA requires that the agency gather and disclose background water quality data from the affected drainages. Certainly, the agencies would not allow an EIS for a proposed mining project to simply ignore potential impacts to a stream simply because background data was unavailable. The Department should be held to the same standard.

488 How and who pays for environmental cleanup if withdrawal occurs, the U.S. Government buy out does not occur, and the New World project does not move forward (it is not clear the clean water decision will or will not be overruled in Circuit Court)?

Agencies Response:

The effect of the mineral withdrawal on reclamation of historic mine sites will be minimal. The immediate effect of the withdrawal is on federal lands where there are currently no unpatented mining claims. The mineral withdrawal does not preclude reclamation on the withdrawn lands, nor does it affect future reclamation on private land. Reclamation and liability for Clean Water Act violations are major components of the New World Mine (NWM) Agreement. Decisions relating to the NWM Agreement are separate from the withdrawal decision. Reclamation may occur under mine "Plans of Operations," under the NWM Agreement, through volunteer efforts to comply with existing laws or by legal order.

Although no additional water quality data (to the NWP FDEIS database) was gathered in direct support of the CCAMW EIS, several days in August 1996 were spent in the study area by two Forest Service Hydrologists to measure watershed area, floodplains, stream morphology and discharge, wetlands, and lakes in parts of the study area outside of the intensive database area for the NWP. Much of this incremental information gathered is used in the descriptions of Affected Environment for Water Quantity, Surface Water Quality, and Wetlands and Floodplains.

If incomplete or unavailable information is not relevant to significant impacts essential to a reasoned choice among alternatives, then it is not required within an EIS (40 CFR 1502.22). It is appropriate to make clear that such information is lacking and to make assumptions to fill voids if needed. The existing aquatic environments for Woody, Republic, and Sheep Creeks are described in terms of existing fisheries potential, sediment regimes and general habitat limitations. Although specific periphyton, macroinvertebrate or water quality data are not available for some streams to contribute to those descriptions, enough information is provided to give the decision maker a general understanding of the fishery value and present condition of those streams. Aquatic resources for streams most likely to be affected by each alternative are described in more detail. As such, the unavailable information is not essential in making a reasoned choice among alternatives. Where data is lacking, it is so noted in the EIS, and some assumptions regarding the periphyton and/or macroinvertebrate communities expected to inhabit those streams are also provided.

Comment:

506 The (Environmentally Responsible Mining: Results and Thoughts Regarding a Survey of North American Metallic Mineral Mines [preprint, February, 1997] Todd, J.W., et al) Survey resulted in several definitive findings of fact:

1)Today's mines are highly regulated and make extensive use of pollution prevention and environmental protection technology. In contrast, old mines were largely unregulated, and operated with few if any measures to protect the environment. Therefore, it is inappropriate to use environmental problems at antiquated mine sites to predict what will occur in the future at modern mines;

2)Environmentally responsible operations are evident at every active mining operation explored by this survey;

3)There are examples of currently active sulfide mines that have been in operation for more than 10 years and have not caused surface or groundwater pollution;

4)There are at least several successfully closed and reclaimed mines that meet the operating criterion but do not yet meet the closure criterion. Thorough environmental monitoring at these sites indicates they are complying with all environmental protection standards and there is every expectation that they will continue to be in compliance at year ten and beyond following closure;

5)There are a number of old lead-zinc sulfide mines in southwestern Wisconsin that operated for more than 10 years, were either closed or abandoned more than 10 years ago, and have caused no known surface water or groundwater pollution problems. These sites meet both the operating and the closure criteria in the proposed legislation; and

6)Operations that mined sulfide ore for more than 10 years, were formally reclaimed, have been closed for more than 10 years, and have not caused surface or groundwater pollution are difficult to locate due to the arbitrary time criteria established in the proposed legislation. A more meaningful measure of compliance with all applicable environmental protection standards would evaluate operating and closed sites that are subject to rigorous and regular monitoring, reporting, and inspection requirements.

Agencies' Response:

The agencies understand, and the Final EIS recognizes, the advances in environmental law and reclamation technology that have contributed to the present-day post-mining successes that are described in this comment. The Secretary of the Interior, in making a decision on the proposed withdrawal, is challenged to identify acceptable risk, based on present-day environmental standards and then determine if mining is compatible with other public land uses in the area.

RELATIONSHIP OF MINERAL WITHDRAWAL TO THE NWM AGREEMENT

Comment:

507 Scenarios A-2 and B-2 rely on the NWM Agreement being implemented. Item 4 of the NWM Agreement reads "The "Agreement" is conditional upon Crown Butte Mines acquiring title to Patented claims owned by Margaret Reeb." Ms. Reeb has flatly stated that her land is not, was not and never will be for sale. Ms. Reebs' land was included in the "Agreement" without her consent.

The NWM "Agreement" will not and cannot be fully implemented in its present form. The Draft EIS identified the CCAMW as the "Preferred alternative". The "Preferred alternative" relies heavily upon the NWM "Agreement" being implemented.

Is the NWM "Agreement" as written, legally dead? Considering the prominent place the NWM "Agreement" holds in the CCAMW EIS process, a legal determination must be made as to its validity, before the final EIS is issued. It would be irresponsible to proceed with the EIS using the NWM "Agreement" as an option, when the NWM "Agreement" is void.

326 The withdrawal would be an important companion to any New World Mine swap agreement that might by negotiated by the federal government, mining, and conservation groups. But it would certainly be important on its own and should be approved separately from the mine agreement. **(Also comment letters 316, 324, 344, 356, 372, 429, 481, 487)**

Agencies' Response:

The NWM Agreement remains reasonably foreseeable. Funds to implement the NWM Agreement were included in the recent "Balanced Budget Agreement" between the President and Congress. The NWM Agreement may need to be re-negotiated if Ms. Reeb's lands are not included.

The EIS considers the environmental consequences using two assumptions: the NWM Agreement is not implemented (Scenarios A-1 and B-1), or it is implemented (Scenarios A-2 and B-2).

Comment:

489 The withdrawal of federal lands from future mineral claim staking will have no impact on protecting water quality and fisheries in the Soda Butte, Clarks Fork and Stillwater drainages from the risk of impacts of future mining, unless it is combined with a completed action on the New World Mine (NWM) Agreement. ...without execution of the NWM Agreement, mining could proceed on lands held by Crown Butte Mines (on both patented and unpatented ground) with or without the withdrawal of other federal lands. In addition, this proposed withdrawal would hamper the EIS process by eliminating alternate facility siting locations. It is also quite possible that mining could take place on private lands not owned by Crown Butte Mines on the large deposits discovered by Crown Butte Mines, either as a separate mining operation or under the State of Montana's Small Miners Exclusion. In addition, the simple act of withdrawal will do nothing that would affect existing impacts to those waters.

505 In addition to water quality, the DEIS concludes that virtually all other elements of the environment would be unaffected by the withdrawal. The DEIS demonstrates that implementation of the New World Agreement might have some benefits, but that in the absence of complete implementation of that Agreement ...offers no environmental benefits.

505 ... if the withdrawal is approved but the New World Agreement is not implemented, it is likely that the withdrawal will result in greater environmental impacts than would have occurred if the federal lands had not been withdrawn. The proposed withdrawal makes no environmental sense, and in the face of the present record, a decision to proceed with the withdrawal would be arbitrary and capricious.

510 ...a withdrawal would be redundant. If the Crown Butte buy-out agreement goes through, the area would not be developed ...as the heart of the mineral district would be gone. If the buy-out does not occur, mining will go on using the private property. The withdrawal would serve no purpose.

Agencies' Summary of Comments:

In the absence of the NWM Agreement, the withdrawal offers no environmental benefits.

Agencies' Response:

The benefits of a mineral withdrawal absent the NWM Agreement are described under Scenario B-1 in Chapter 3 for each of the resource areas. Since the area of highest mineral potential remains available for mining under this Scenario, many of the effects are similar to those described under the no withdrawal Scenario A-1. The mineral forecast estimates similar levels of development for both Scenarios.

As outlined in Chapter 3, the mineral withdrawal does preclude future mineral entry on 17,760 acres of federal land. Potential for direct mining-related effects to these lands is eliminated; although, indirect effects could occur from mining activity on private land and unpatented mining claims. Lands withdrawn from mineral entry include most of the roadless areas, lands immediately adjacent to Yellowstone National Park and designated wilderness areas, lands of high scenic integrity, valuable wildlife habitat, and important recreation areas. These resources would not be directly affected by future mining.

Comments:

303 As for Crown Butte, the permitting process should have been allowed to work with no buyout and the permit given or denied on scientific grounds not politics.

495 It seems to me premature and out-of-sequence to withdraw lands from mineral entry before the completion of the New World mine's DEIS. To do so prejudges the outcome of the mine proposal before the environmental compatibility of that project has been ascertained and revealed to the public.

Complete and release the New World DEIS. With the facts before them, the public and politicians would have a proper basis on which to make an INFORMED judgement, and, if warranted, make political decisions for buyouts or withdrawals.

506 It is unfortunate that the Secretary of the Interior chose to short-circuit completion of the NEPA evaluation underway for the proposed New World mine project.

489 Regardless of which alternative is selected, I believe that it should await the outcome of the NWM Agreement. One is premature without the other and could severely limit the available NWM Draft EIS alternatives. ...without execution of the NWM Agreement, mining could proceed on lands held by Crown Butte Mines (on both patented and unpatented ground) with or without the withdrawal of other federal lands. In addition, this proposed withdrawal would hamper the EIS process by eliminating alternate facility siting locations. It is also quite possible that mining could take place on private lands not owned by Crown Butte Mines on the large deposits discovered by Crown Butte Mines, either as a separate mining operation or under the State of Montana's Small Miners Exclusion.

505 The withdrawal action should be deferred until after such time as the New World Agreement has been successfully and completely implemented. The DEIS demonstrates conclusively that if the New World Agreement cannot be implemented, the proposed withdrawal would be counterproductive and potentially damaging to the area environment.

Agencies' Summary of Comments:

It is premature and out of sequence to withdraw lands from mineral entry before completion of the New World Project (NWP) EIS. To do so prejudges the outcome of the mine proposal before the environmental compatibility of that project has been ascertained and revealed to the public. The withdrawal could affect facility siting options under consideration should the NWM Agreement falter and should the mine permitting process be reinstated. The withdrawal could be counter-pro-

ductive and potentially damaging to the area environment due to limiting the availability of facility sites by forcing development on private land.

Agencies' Response:

The New World Project Environmental Impact Analysis was halted as a condition of the NWM Agreement of August 12, 1996. Crown Butte Mines, Inc., the project proponent who was financing the preparation of the EIS, was a party to the Agreement.

A decision on the mineral withdrawal is anticipated for August of 1997. The third checkpoint for the NWM Agreement is also in August of 1997. The Secretary of the Interior may know the outcome of the NWM Agreement by the time the withdrawal decision is made. If the NWM Agreement is not resolved by August of 1997, the Secretary could make a withdrawal decision taking the facility siting issue into account, or he could defer the decision until outcome of the NWM Agreement.

If the segregation expires before a withdrawal is in place, it is reasonable to expect that additional claims would be filed in the area.

If the NWM Agreement is terminated, Crown Butte Mines, Inc., could reinstate their application and restart the NWP EIS.

Comment:

439 The DEIS states that lands donated to or purchased by the United States are not available for mining under the General Mining Law of 1872; however, they are available for mineral leasing. Does this refer to just hardrock mineral leasing or does it include leasing for oil, gas, and geothermal resources?

Agencies' Response:

Unless withdrawn, federal lands are typically open to mineral location and entry under the General Mining Law of 1872. Hardrock minerals on certain acquired lands may be available for leasing under the Acquired Lands Mineral Leasing Act of August 7, 1947. The withdrawal precludes hardrock mineral leasing, but does not include leasing for oil, gas and geothermal resources.

Comment:

439 ...unless the mineral withdrawal is implemented, even if the NWM Agreement is implemented at a cost of $65 million in federal assets, Crown Butte Mines, Inc. or any other entity, could restake the claims and negate the purpose of the NWM Agreement unless some additional action is taken to prevent mineral entry in the area covered by the NWM Agreement. ...there would seem to be no justifiable reason for entering into the NWM Agreement without concurrent implementation of the proposed mineral withdrawal.

Agencies' Response:

As stated in Chapter 1, Purpose and Need, "The proposed mineral withdrawal would help meet the intent of the NWM Agreement by precluding mineral development on property interests acquired by Crown Butte." Unless acquired lands and unpatented mining claims controlled by Crown Butte Mines, Inc., are withdrawn by a decision made in this EIS process, in a subsequent environmental analysis, or by legislation, the lands acquired from Crown Butte Mines, Inc., would reopen to filing of new mining claims or applications for mineral leasing, depending on how they are acquired. Unpatented mining claims on federal land would reopen to filing of mining claims.

Comments:

360 Can any other activity be done on the Withdrawal area such as logging, gas-oil exploration? Is hunting still allowed?

439 The DEIS states here that "private minerals" would be acquired by the NWM Agreement. Does this include acquisition of private surface rights, or will Crown Butte Mines, Inc. retain the option of development of the private lands for purposes other than mineral development (residences, resorts, etc.) if the company so chooses?

439 What can and cannot be done with private lands (patented claims) in the study area needs to be clarified. What specifically is meant by acquiring "property interests" in private lands? If the federal government acquires private mineral rights, do the private owners retain surface rights that can be developed for residential, resort, or other purposes?

Agencies' Response:

The NWM Agreement calls for Crown Butte Mines, Inc., to convey all interests which includes the surface and mineral estate. In general, if the United States acquires only the mineral rights, there are no restrictions on

development of the surface unless specified by an easement or restriction on the deed. A mineral withdrawal does not restrict other uses of the land, such as hunting, logging, recreation, etc.

Comment:

489 How is it possible that the Cooke City Area Mineral Withdrawal and the New World Mine agreement are not considered connected actions.

Agencies' Response:

Actions are connected if they:

(1) Automatically trigger other actions which may require environmental impact statements;
(2) Cannot or will not proceed unless other actions are taken previously or simultaneously;
(3) Are interdependent parts of a larger action and depend on the larger action for their justification. (40 CFR 1508.35)

The relationship between the proposed mineral withdrawal and the NWM Agreement is described in Chapter 1, "Purpose and Need," and "Scope of Analysis." They are not considered connected actions in that either action could proceed independent of the decision on the other action. The mineral withdrawal was proposed one year prior to the NWM Agreement and could be implemented with or without implementation of the NWM Agreement. The NWM Agreement could be implemented with or without the mineral withdrawal.

DECISIONS TO BE MADE

Comment:

360 Can this withdrawal if O.K ed be revoked anytime or only after 20 years? Could a new administration revoke it before the 20 years is up?

Agencies' Response:

The Code of Regulations at 43 CFR 2370 outline the procedure for withdrawal revocation. The withdrawal could be revoked at any time.

Comment:

435 Given the fact of continual improvements and changes in regards to new technologies a project that fails to meet required standards today might be substantially different several years from now or even in a matter of months. Therefore, to have imposed a blanket withdrawal of up to 20 years would be irresponsible and would ding responsible environmentally sound projects from ever being considered.

Agencies' Response:

Available and emerging technologies are important considerations, but they are not necessarily the only criteria in determining the need for a mineral withdrawal. The question remains: Given the resource values of this area, is mining an appropriate use on these federal lands?

DECISIONS BEYOND THE SCOPE OF THIS ANALYSIS

Comment:

439 Withdrawal of the federal lands from hardrock mineral entry should be quickly followed by a thorough study of remaining unpatented mining claims within the study area to determine their validity. Invalid claims should be included in the withdrawn lands, as is proposed in the preferred alternative.

Agencies' Response:

Determining the validity of the remaining mining claims is beyond the scope of the withdrawal decision. Forest Service policy in regard to mining claims in withdrawn areas on National Forests would be to schedule a mining claim validity examination by a FS Certified Mineral Examiner if and when a claimant submitted a "Plan of Operations" to conduct activities on his or her claims. The Examiner would prepare a report assessing the extent of valid existing rights. If the claims are determined to be valid and permitting requirements are met, the plan would be approved. If the claims are determined to be invalid, the plan would not be approved, and, if the Department of the Interior concurred with the report findings, a contest action before the USDI Office of Hearings and Appeals would be scheduled, seeking to have the claims declared null and void.

Comment:

360 How can we be assured the unpatented claims will be checked for not following rules and regulations and "repossessed"? This should be done every year. Are patented claims under rules also?

Agencies' Response:

Determining the validity of the remaining unpatented mining claims and ensuring adherence to laws and regulations is beyond the scope

of the withdrawal decision. Unpatented mining claims require the annual payment of a claim maintenance fee to retain rights associated with mining claims. If any surface disturbing activities are planned, the claimant must file a "Notice of Intent" or "Plan of Operations" with the Forest Service. Mineral development on private land is subject to State of Montana regulations.

Comments:

494 We also understand that some environmental damage which has occurred in the area may be mining related. Crown Butte has undertaken several remediation activities in the area to stabilize banks and improve water quality. I am sure they would be willing to undertake almost any other reasonable measure to improve or prevent environmental damage to the area.

488 ...if mining were allowed in the case of the New World Project, the current environmental damage could be corrected as a part of the project, and not at taxpayer expense...

374 CBMC should be commended for an excellent mining and reclamation plan. The company has persevered through a very difficult permitting process. There is no doubt ... that the company should be granted a mining permit.

388 Sensible development of our natural resources, including mining, should be a priority. It is utterly ridiculous for the government to pay a mining company not to mine.

405 Mining provides many good paying jobs in the state and the mining companies pay many dollars in taxes. With the environmental controls now in place, the permitting process should go forward and decisions should be made on the findings rather than using this as a political ploy.

405 The federal government should not have interfered with planning and the permit process that was progressing in Montana. Taxpayers should not be forced to pay for a buy-out of a proposed mine that may never have been permitted in the first place.

507 ...what issues of protecting "*...water quality and fresh water fishery resources within the watersheds of Soda Butte Creek, Clarks Fork River, and Stillwater River from the effects of future hardrock mining activities that could occur on federal lands in the headwaters of these streams.*" are not currently addressed in the NWM PDEIS?

331 I strongly feel that current mining technology can offer no guarantee that the Cooke City water quality ...would not be imperiled by the New World Mine.

Agencies' Response:

The Crown Butte project mining and reclamation plans, as well as the New World Project "buyout," (Agreement) are beyond the scope of the decision to be made in the Cooke City Area Mineral Withdrawal environmental impact assessment process.

Comments:

507 If the CCAMW is implemented for a period of 20 years, FLPMA allows for only one 20-year extension, an extension may or may not be granted in 2017 depending upon the political winds at the time. Under FLPMA after 20-40 years, the area will be open again to mineral location. Why doesn't the Draft EIS offer a third option to the two current alternatives of the withdrawal: "ALL or NONE" that can be used as a cornerstone of progressive compromise to the issue of mining on public lands instead of a short sighted all or none approach?

320 My only concern is that it only for 20 years instead of forever. **(Also comment 375)**

Agencies' Response:

By statute (Section 204 of the Federal Land Policy and Management Act [FLPMA]), withdrawals affecting more than 5,000 acres are limited to 20 years. At the end of the withdrawal period, the Secretary may extend the withdrawal if it is determined that the purpose for which the withdrawal was first made requires the extension (Sec 204 [f] FLPMA). This extension would limited to an additional 20 years.

Comment:

439 In conjunction with the mineral withdrawal and implementation of the NWM Agreement, an appropriate contingency program should be initiated for acquiring remaining valid but unpatented mining claims and patented private land.

Agencies' Response:

The analysis focuses on whether or not a mineral withdrawal is appropriate for this area. Acquisition of lands under the NWM Agree-

ment, as well as future acquisition of private land or mineral rights, is a separate action beyond the scope of this analysis. Land acquisition programs are determined at the forest level and are incorporated into Forest Plans.

Comment:

439 Although addressing fluid leasable minerals (oil, gas, and geothermal) may be beyond the scope of this DEIS, in order to properly accomplish the new management emphasis for the study area that is reflected in the proposed withdrawal of locatable and leasable hard rock minerals, the federal lands within the study area should also not be available for leasing of oil, gas, and geothermal minerals. ...if the study area is not already withdrawn from mineral leasing, as seems unlikely, this should be accomplished by amendment or revision of both forest plans at the same time leasable hardrock mineral entry. Leasing the study area for fluid leasable minerals and relying on no surface occupancy or other stipulations to protect the area is insufficient.

Agencies' Response:

Future management of oil, gas and geothermal resources is beyond the scope of this analysis. The Custer National Forest has completed the Beartooth Mountains Oil and Gas Leasing EIS (USDA Forest Service, 1993). Custer National Forest lands within the study area are administratively not available for leasing. For the remainder of the withdrawal area on the Gallatin National Forest, the environmental analysis to determine available lands has not been completed.

Under the "Land Use" section, "Geologic Resources, Other Minerals":

"There are no known oil and gas reservoirs within the study area. Paleozoic sedimentary rock exposed at or near the surface are often reservoirs in other areas, but are presumed to be too shallow and too fractured to have retained any generated hydrocarbons."

Comments:

439 The entire Stillwater watershed within the study area and the Clarks Fork watershed in the study area north of the Lulu Pass Road and Fisher Creek should be added to the Absaroka-Beartooth Wilderness Area.

468 Should a "New World Mining and Historical Recreation Area" be established to cover the area of the proposed withdrawal? If this concept is implemented, it would provide permanent protection for the important values in the area. In addition, it would provide substantial economic benefits to the recreation based economies of Cooke City and Silver Gate.

507 Is the CCAMW eligible for wilderness status? If not why not?

Agencies' Response:

Decisions concerning future wilderness designation or establishment of a National Recreation Area are beyond the scope of this analysis. Establishment of wilderness or NRA's requires Congressional legislation. Forest Plan direction for both the Custer and Gallatin National Forest recognizes the importance of recreation in this area.

Comment:

507 If under current Federal and State law, "*water quality and fresh water fishery resources within the watersheds of Soda Butte Creek, Clarks Fork River, and Stillwater River* [ARE NOT PROTECTED] *from the effects of future hardrock mining activities that could occur on federal lands in the headwaters of these streams...*" then how can the laws be improved to accomplish the desired protection?

Agencies' Response:

The adequacy of existing laws and regulations, as well as potential improvement to laws, is beyond the scope of this analysis. A mineral withdrawal is not necessarily contingent upon whether or not existing laws and regulations can be met. Rather, a mineral withdrawal considers whether mining is an appropriate use for the area, given the resource values present.

ISSUES AND CONCERNS

Comment:

439 page 7, Issues and Concerns, Recreation, Yellowstone NP, and Special Areas— –The DEIS misstates the issue here. Mineral withdrawal would instead of may help maintain existing character, etc. of the area. Withdrawal would instead of could diminish existing opportunities for solitude in nearby wilderness. Future mineral development would instead of could alter the character of roadless areas.

Agencies' Response:

As described in the "Introduction" to Chapter 3, the effects of a mineral withdrawal are expressed in general terms based on assumptions about future development. Given that a site-specific proposal is not being evaluated, the use of "may" or "could" is appropriate.

Comment:

392 pg.8 Wildlife: This section infers that the *wildlife* would be impacted by mining.

As demonstrated at other Montana mines, each mine site, because of permit restrictions and safety is closed to hunting and public incursion. The sites become wildlife preserves causing far less impact than the public recreation areas.

Agencies' Response:

Effects to wildlife are described in Chapter 3. The effects vary by species. While some species are tolerant of human disturbance, other species are more sensitive to disturbance.

GENERAL COMMENTS/OPINIONS EXPRESSED ABOUT CHAPTER 1

Comments:

383 I am concerned that the BLM/Forest Service proposal to withdraw 22,000 acres in and around Cooke City ...may be linked to the deal made between Battle Mountain Gold and the Clinton Administration over the New World Mine and the UN's World Heritage Committee recommendation that a 100-mile buffer zone be placed around Yellowstone Park.

387 We ...must not let our resources be collared or traded or put to rest because the Government or its agencies have been cornered by a few who think they are saving the world. The growing world needs Montana and we must not turn our backs on the opportunity.

506 The public record on the New World Mine situation clearly shows that Interior and agencies under its direct control, such as the National Park Service, have mounted a well orchestrated, consistent campaign predicated on uncompromising opposition to *any* form of mining activity in the study area. ...*the only reasonable conclusion that a prudent person can draw is that the federal government will continue to actively interfere in the ability of a mining claim holder to legally exercise their valid existing rights.*

407 I think some of you are trying to rationalize your work by saying that prior existing rights will be protected. That is simply not true because mineral withdrawals are designed to stop all future mining.

472 A withdrawal would set a dangerous precedent for taking public and private land away from the people. The problem is not mining verses saving the environment. It is a matter of the people losing their land — both public and private.

369 The withdrawal proposed puts too much authority into the hands of too few people. If these decisions are not made using defined, quantifiable methods, then we have no real protection of our public lands other than the current attitude and agenda of the people who happen to be administering BLM.

422 We would like to know is why any one person is able to close down a mine or mines in a state without thought of the people in that state have a vote. Why should more land become National Parks, Wilderness, and National Monuments without the vote of the people?

392 The Montana State MEPA process and the U.S. Government NEPA process more than protects the environment. Sadly enough, the MEPA/NEPA process does not provide safety from ignorance, stupidity and political interference. However, it should protect us from the bias and lies through omissions presented in this DEIS.

397 The Draft EIS does not support the premise that Alternative A does not meet the test of "protection of the watersheds within the drainage's of the Clarks Fork of the Yellowstone River, Soda Butte Creek, and the Stillwater River, and the water quality and fresh water fishery resources within Yellowstone National Park." In fact, the Draft EIS supports the view that **Alternative A** would meet the purpose of "protecting" those resources mentioned.

407 Isn't an EIS supposed to be written to help guide a decision maker? Your EIS has been written to support the decision that has already been made, that was to buy votes last fall for the Clinton Administration and stop future Cooke City area mining.

439 In order to properly accomplish the fundamental reasons for proposing the mineral withdrawal ...*it* is essential that Scenario B-2, implementation of the NWM Agreement or equivalent acquisition of Crown Butte Mines mineral and surface interests, be accomplished in conjunction with the withdrawal of federal lands.

478 On page 29 the DEIS indicates that the analysis "focuses on a policy level decision". However the document has little discussion of the policy behind the decision or the policy implications of a withdrawal. In fact the politics behind the proposed withdrawal is a key element of the proposal and it is not discussed at all. The consultation and coordination section (Chapter 4) is an obvious attempt to whitewash over the actual backroom politics of the withdrawal and DEIS process.

479 It is very likely that the Cooke City Area Mineral Withdrawal is unnecessary. Mining companies evaluate the political risks of an area, as well as mineral potential, to receive project financing. This area is now very high risk, the regulatory process cannot be anticipated because it can be circumvented at whim.

496 I am very much apposed to the actions of President Clinton in trying to close all mining around Cooke City. It has always been a mining area and has not proved to me it has had bad effects on Yellowstone Park and its waters. The charges that it has or will are all problematical with all possible effects and nothing proved and are all propaganda.

497 The Draft EIS does **not** indicate that there are **any** unacceptable impacts to the area as a result of mining.

450 There is no similar area in the continental, accessible U.S. It must be protected intact.

488 Your analysis of the mineral potential for the area to be withdrawn from mineral entry (Appendix B to the DEIS) indicates the area has significant potential for mineral development. The data outlined in this segment of the DEIS alone, is sufficient to justify the area not be withdrawn from mineral entry.

505 The DEIS recognizes that permitting requirements that would require treatment of poor water that is presently contributing to flows in Daisy and Fisher Creeks could improve water quality in these streams. If the potential water quality impacts associated with the New World Project are inconsequential, then it follows that the potential impacts associated with the hypothetical operations considered for evaluation in the DEIS—assuming they are properly permitted under existing laws and regulations—are also unlikely to threaten water quality. In fact, the DEIS correctly notes that even if additional mining in the area proceeds, water quality would likely improve over existing conditions because of discharge permit limitations and State Water Quality Laws." DEIS at 64.

506 It is clear that the DEIS was intended to cover a mandatory legal base and justify foregone conclusion. ...the NEPA review process undertaken by the BLM and USFS in response to this proposed action will be used by the Secretary of the Interior to rationalize a political decision that is not supported by a preponderance of the objective evidence available. It is regrettable that Interior seems unwilling to accept the conclusion of the legally prescribed process for objectively evaluating major activities on federal lands: that any mine being proposed today will result in negligible long term effects to the environment.

506 ...if the deficiencies raised in our comments are properly addressed, the objective, unbiased conclusion would be that there is little to be actually gained by the proposed withdrawal. In fact, just the opposite.

Our opposition to this proposed mineral withdrawal is consistent with NWMA'S long standing policy of discouraging large scale, long term withdrawals in highly mineralized areas, except under the most compelling of circumstances.

496 What right does President Clinton have to try to give away private property?

405 The election is over and now is the time for this promise to be forgotten along with many of the others made by Clinton in order to buy votes.

422 People from the east come in to our state and proceed to try to tell us how to run our affairs.

408 I do not appreciate the fact that a foreign country will profit from the devastation of Montana's land and that the resultant mess will be left to pollute us forever.

435 The NEPA process should be allowed to work according to the law in regards to any and all proposed mining projects. Current environmental laws are fully capable of operating and arriving at a fair and impartial decision as to whether any proposed mining operations can be done in a responsible and environmentally sound manner. That is the purpose of having and conducting the process and all proposed projects should be judged according to the facts and merits. If a project is not capable of meeting all required standards of operation in an environmentally sound and responsible manner it should be denied bond on facts not emotional rhetoric perpetrated by anti-mine elements who continually resort to misleading and distortions and in many cases outright lies.

Agencies' Response:

Thank you for your comments. They have been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

CHAPTER 2 ALTERNATIVES

INTRODUCTION

Comments:

406 In all of the analysis framework it (the NWM Agreement) is either implemented and there is no NWM or it is not implemented and the NWM is constructed. These seems overly simplified. The whole incentive for the company to enter into the agreement was the Clean Water Act lawsuit and the damages it faced. So the impacts without implementation of the NWM Agreement are not necessarily all that the EIS presents so confidently. Similarly, if the NWM Agreement is implemented it may not be by all parties. The company, federal government, and environmental plaintiffs may all agree to lands and appropriated monies in exchange for lands and rights—but without some involved land owners (i.e. Margaret Reeb) consenting. In this case, while the likelihood of impacts on the scale of the NWM are greatly reduced, they are not totally eliminated as the EIS seems to suggest.

507 Will a 3rd. set (A-3 and B-3) Of scenarios be developed, using the contingency that the NWM Agreement is modified to transfer unpatented claims owned by Crown Butte but excluding Ms. Reeb's's property?

Agencies' Response:

Because of the uncertainty concerning the outcome of the NWM Agreement, each alternative was analyzed assuming the NWM Agreement was not implemented as well as assuming the NWM Agreement was implemented. As of this writing, the NWM Agreement is still a valid proposal as presented on August 12, 1996. Assumptions concerning the NWM Agreement were used as a basis for analyzing impacts of the proposed withdrawal. The NWM Agreement assumptions did not consider all the many possibilities, but the assumptions do reflect existing proposals and what is considered to be the most likely Scenarios. These Scenarios include a wide range of development possibilities.

Comments:

479 The scenarios that form the "basis for environmental impact analysis" are flawed. The scenarios which forecast future mining and/or exploration drilling operations (scenario A-1, A-2, B-1, and B-2) are unrealistic at this point. After the Presidential actions completely circumventing the NEPA process at New World, it is difficult to imagine a mining company that would invest in the area.

469 The following alternatives provide options for a reasonable compromise to a highly polarized issue.

Alternative 1: Withdraw areas along streams and perennial drainages forming protective corridors.

For example: Withdraw a protective corridor 1/4 mile wide along both sides of all live, year around streams, for a total protective width of 1/2 mile. Withdraw a protective corridor 1/8 mile along both sides of all seasonal streams for a total protective width of 1/4 mile.

The width and location of each "Protective corridor" could be determined on a drainage by drainage basis, based upon the drainages surface water run off potential, seasonal flows, acidity of country rock, and the natural potential of the drainage to support "...fresh water fishery resources..."

The Buffer *Zone* alternative will also allow for responsible mineral development as per the "United States Forest Service Minerals Program Policy."

Alternative 2: Recognizing the unique geographic, cultural, mineral, recreational, etc., characteristics of the new World Mining district. A non partisan, volunteer professional management panel, consisting of several highly experienced, highly trained, and professionally licensed persons representing government, industry and environmental groups, committed to the dual goal of "Environmental Protection and Resource Production" would be formed to act as "custodians" of the proposed withdrawal area. The purpose of the professional management panel would be to provide for independent oversight and quality control of any proposed or active mineral activities within the withdrawal area.

The professional management would be charged with safeguarding "...water quality and fresh water fishery resources within the watersheds of Soda Butte Creek, Clarks Fork River, and Stillwater River...

The professional management panel would report directly to the District Ranger has regulatory authority over mining operations within the National Forests. The recommendations of the professional management panel would then be considered as part of a review for a "Plan of Operations."

Alternative 3: Withdraw areas along streams and perennial drainages forming protective corridors, and form a nonpartisan, volunteer professional management panel, consisting of several highly experienced, highly trained and professionally licensed persons representing government, industry and environmental groups, committed to the dual goal of "Environmental Protection and Resource Production."

505 ... it would be reasonable to simply defer the withdrawal until all uncertainties associated with the New World Agreement are resolved and the agreement is implemented. There is nothing in the DEIS to suggest that a delay in the withdrawal would result in any potential for increased mineral development or for increased environmental impacts. Similarly, the Department could achieve the most environmental benefits by withdrawing only those areas which are (1) within the areas of highest potential for mineral development, and (2) outside of the areas of federal land which might be used for the New World Project. Such an alternative would prevent expansion of mining opportunities outside of the existing private lands and unpatented mining claims, but at the same time would allow development of the New World Project in a manner that would minimize potential adverse environmental impacts. Once again, any further withdrawals could be deferred pending implementation of the New World Agreement, or other measures could be taken to limit mineral development of the property acquired under that Agreement.

505 The DEIS also acknowledges that portions of the withdrawal could be deferred to a later date, but fails to provide any environmental analyses of there(s)in alternative(s). Importantly, ...there(s)in alternative(s) would provide more environmental benefits than the preferred alternative included in the DEIS, and ...would be equal or superior to the preferred alternative in achieving the stated purpose and need of the proposed withdrawal. As noted, Crown Butte believes that detailed consideration of there(s)in alternative(s) is required by NEPA and that ...the suggested alternative(s) is environmentally preferable to the preferred alternative identified in the DEIS.

505 The DEIS also suggests an additional alternative which the Department has not considered: though the DEIS recognizes that "reclamation of historic mining activities ... could greatly improve water quality in study area streams," ... the DEIS fails to evaluate the impacts of a "reclamation" alternative, i.e., an alternative that emphasizes the reclamation of historic mining activities rather than the frustration of future mining opportunities. ...such an alternative would likely result in improvements to the existing environment without the costs associated with foregoing development of the significant mineral resources in the study area.

507 The following alternatives provide options for a reasonable compromise to a highly polarized issue.
Alternative 1: Withdraw those watersheds and drainages naturally capable of producing or sustaining a fresh water fishery resource, and those watersheds and drainages naturally capable of producing water year round, in sufficient quality and quantity to support a fishery source.

Many of the streams in the proposed withdrawal area are naturally devoid of fish. Many streams within the proposed withdrawal area HAVE NOT, CAN NOT, AND WILL NOT, EVER SUPPORT "fresh water fishery resources".

507 Alternative 2: Withdraw those watersheds and drainages naturally capable of producing or sustaining a fresh water fishery resource, and those watersheds and drainages naturally capable of producing water year round, in sufficient quality and quantities to support a fishery resource, and

withdraw 250' along both sides of streams and perennial drainages in the remaining watersheds and drainages forming protective corridors and natural buffer zones.

The final width and location of each "Protective Corridor" could be determined on a drainage by drainage basis, based upon the drainages surface water run off potential, seasonal stream flows, acidity of country rock and the natural potential of the drainage to support "...*fresh water fishery resources*...".

The Buffer zone alternative will also allow for responsible mineral development as per the "United States Forest Service Minerals Program Policy.".

505 ...*the Department's own analysis suggests that the DEIS should have considered an alternative with a more narrowly focused withdrawal designed to minimize the potential impacts (or "risks") of both the New World Project and future mining.*

506 A real issue identified during scoping was, *would a partial withdrawal satisfy the desire to greatly enhance protection afforded Yellowstone National Park?* The corollary issue is how large would such a 'buffer' need to be? The Team may have been justified in concluding that a 1/4 mile 'buffer' would not offer a significant increase in protection, nonetheless they failed to consider and properly evaluate reasonable alternative buffer scenarios as clearly required by NEPA.

At a minimum, a scenario must be developed that considers the effects of withdrawing that portion of the study area with the potential to drain into Yellowstone National Park via the Soda Butte Creek drainage, along with a logically derived buffer strip along the boundary to Yellowstone National Park.

489 ...other alternatives for the withdrawal such as reducing the withdrawal to a buffer zone adjacent to YNP were not given due consideration. This could have been evaluated using a buffer zone based on drainage basins or topographic divides that would have effectively protected YNP.

Agencies' Summary of Comments:

Various alternatives were suggested during the comment period. These included:
—withdrawing areas along streams and drainages (comment letter 469),
—establishing "custodians" of the proposed withdrawal area (comment letter 469),
—establishing protective corridors along streams and forming a nonpartisan panel to achieve "environmental protection and resource production" (comment letter 469),
—deferring the withdrawal until all uncertainties associated with the NWM Agreement are resolved (comment letter 505),
—withdrawing only those areas which are in the area of highest mineral development potential but outside the areas that might be used for the New World Project (comment letter 505),
—emphasizing reclamation of historic mining activities (comment letter 505),
—withdrawing that area that drains into Yellowstone National Park (comment letters 489, 506),
—withdrawing watersheds and drainages capable of sustaining fisheries (comment letter 507),
—withdrawing watersheds and drainages capable of sustaining fisheries and withdrawing a 250 foot protective corridor along other perennial drainages (comment letter 507).

Agencies' Response:

All of these alternatives were carefully considered. Many of these alternatives were mapped to determine what lands would be available for mining activities. After available areas were identified, a foreseeable mineral development scenario was predicted for each alternative. These new scenarios were compared to the Scenarios that were analyzed in detail (Scenarios A-1, A-2, B-1, and B-2). If the land available for mining or the mineral development forecast was similar to one of the Scenarios that was already analyzed, the impact analysis would also be comparable. Therefore, the new alternative was not analyzed in further detail. Other alternatives were not analyzed in detail, because they do not provide a basis for analysis or the "Decision to be Made" was beyond the scope of this analysis. See text revision and discussion in Chapter 2, "Alternatives Eliminated From Detailed Study" for a discussion of each alternative.

Comment:

505 Notably, the DEIS concedes that the withdrawal is not necessary to prevent future mining on the lands that might be acquired pursuant to the New World Agreement, and notes explicitly that "Congressional action, future NEPA analysis associated with land exchanges or purchases, or

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restrictions on the deed such as a conservation easement" are all alternatives to the withdrawal. ...but fails to provide any environmental analyses of (this) alternative(s). Importantly, ...(this) alternative(s) would provide more environmental benefits than the preferred alternative included in the DEIS, and ...would be equal or superior to the preferred alternative in achieving the stated purpose and need of the proposed withdrawal.

Agencies' Response:

The NWM Agreement, by itself, does not withdraw from future mineral location and entry any lands that might be acquired by the federal government. Unless those lands would be withdrawn, they would become available again for mineral location and entry. Interests that could be acquired under the NWM Agreement include an estimated 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims. Therefore, it was assumed under Alternative A, No Mineral Withdrawal; Scenario A-2, NWM Agreement Implemented that the U.S. Government would make acquired lands unavailable for mining through Congressional action, conservation easements, or some other action to protect the acquired properties. While the impacts of a Congressional withdrawal or conservation easements would be the same as those identified under Scenario A-2, the decision to take those actions are beyond the scope of this analysis.

ALTERNATIVES STUDIED IN DETAIL

Comment:

397 In the Draft EIS Alternative A1 is presented as the worst case scenario. However, as mentioned above, it does allow for the protection of water resources and it is assumed, rightly so, that the mining operators in the study area would be required to meet all regulatory and statutory obligations. In fact, the Draft EIS addresses the issue of legislative changes which states:

"For purposes of analysis it is assumed that none of these potential legislative changes will have an appreciable affect on the level, or amount, of mineral activities in the Cooke City area. It is also assumed that proposed operations will be scrutinized more thoroughly and compliance requirements will be subjected to higher standards in this area due to its proximity to Yellowstone NP, the A-B Wilderness Area, and Clarks Fork Wild and Scenic River corridor."

There are additional regulatory requirements which must be met, and could be met if Alternative A1 is the preferred alternative. However, the Draft EIS presents Alternative A1 from the point of view that the mining industry will not meet the regulatory and statutory requirements currently required of all mining operations. Further, that mining operators will not comply with the additional statutory or regulatory requirements providing for the protection of Yellowstone NP watershed, Wild and Scenic Rivers, and Wilderness as examples. I believe it incorrect to use this premise as the basis for not selecting Alternative A as the preferred alternative.

Agencies' Response:

Alternative A is the "No Action" Alternative. The impact analysis for Scenario A-1: No Mineral Withdrawal; NWM Agreement Not Implemented, is based on a mineral development forecast (Appendix B) that represents a reasonable expectation of future mining activity under this Scenario. The impacts of mining related activities discussed in Chapter 3 consider application of regulations, management practices and standard procedures to protect the environment. Many of the anticipated impacts would fall within acceptable levels and meet current standards. However, the analysis is also based on anticipated risks associated with mining. The impacts of these anticipated risks are also discussed in appropriate sections and in Appendix H, FAILURE MODES EFFECTS ANALYSIS.

Comment:

439 page 10, Alternatives Studied in Detail, Alternative A (No Action), 2nd paragraph in this section—— The DEIS describes that constraints for exploration and mining for locatable minerals on USFS lands would be subject to certain surface management regulations, and that surface occupancy and use would be limited to mining operations. Does this apply to both patented and unpatented land?

Agencies' Response:

A patented mining claim is a parcel of land where ownership of both surface and mineral estate has been conveyed to a private party. Like any other private land, once ownership has been conveyed, the land can be used for purposes other than mining. Federal surface

management regulations do not apply to these private lands. However, state regulations may apply to mining and other activities on private lands.

Comments:

507 Table 2-1, scenario B-1, of the CCAMW identifies 8,400 acres of land available for mining if the CCAMW is implemented. How will the goal and stated purpose of the withdrawal be accomplished when the CCAMW EIS. ...identifi(y)ies these 8,400 acres as containing the highest probability of mineral development?

How effective on a scale of 1 - 100, will the CCAMW be in achieving its stated purpose under scenarios B-1: 8,400 acres open to mining and B-2, 2,480 acres open to mining? Please state the measuring criteria used for the assessment.

Agencies' Response:

How well the purpose and need is met would depend on the amount and location of mining activity that would be anticipated with each Scenario. The amount and location of mining activity also depends on whether the NWM Agreement is implemented. Analysis of each resource issue addresses this question in detail in Chapter 3. Overall conclusions are summarized in Chapter 2, Table 2-3 "Comparative Summary of Impacts."

Comment:

500 Scenario B-1, page 14: The scenario description starts with the statement that the NWM Agreement is not implemented. But midway through the first paragraph of this section , a subsequent sentence states that "The forecast assumes the NWM would be developed;" This sentence is probably accurate, but confusing in this context.

Agencies' Response:

The sentence has been modified to state "The forecast assumes the New World Project would be developed." If the NWM Agreement is not implemented, the forecast assumes the New World Project would be developed.

MANAGEMENT COMMON TO ALL ALTERNATIVES

Comments:

488 The DEIS analysis ...does not discuss to an adequate extent the legal and/or regulatory regime under which any mining operation must operate. A full discussion must be included of the protections afforded the area of the proposed withdrawal by any mining operation proposed within the area by the legislation and regulation currently in place.

507 If under current Federal and State law, "*...water quality and fresh water fishery resources within the watersheds of Soda Butte Creek, Clarks Fork River, and Stillwater river* [ARE PROTECTED] *from the effects of future hardrock mining activities that could occur on federal lands in the headwaters of these streams...*" then how is this protection accomplished?

507 If Federal and State laws are in place today to prevent environmental damage, protect water and air quality, protect fish and wildlife, require reclamation bonding and reclamation, what are they? Please list all environmental laws and regulations applicable to an operation such as the NWM.

Agencies' Response:

In response to these comments, the authorities for the various permits, licenses, and approvals required for mining related activities have been added to Chapter 2 of the Final EIS under the discussion of "Management Common to All Alternatives." This includes a list of the various laws and regulations as well as the purpose of each. The discussion of mining related actions in the introduction of Chapter 3 also summarizes the mining actions and references the USDA Forest Service General Technical Report INT-35 Anatomy of a Mine From Prospect to Production which reviews mining laws and regulations and their application to mining in western states.

COMPARISON OF ALTERNATIVES

Comment:

478 The table summarizing impacts (p 22) uses a quantitative description of **more or less likely** impacts. What is the basis for this ranking? Where in the document is this information displayed? Additionally, there needs to be a discussion of the significance of any of these impacts. Without an understanding of the implications or significance the reader has no way of evaluating the agencies table.

Agencies' Response:

A complete description of impacts for each resource is contained in Chapter 3. The antici-

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pated impacts described in Chapter 3 are based on an interdisciplinary analysis of the alternatives and Scenarios. The analysis was based on review of available literature, scientific assessment, and professional judgement which are also described in Chapter 3. Based on professional judgement and analysis of the scenarios, a comparative ranking of the scenarios was possible.

The credentials for the interdisciplinary team members are summarized in Chapter 4, and references are included in the document. Some methodologies and assumptions for analysis are contained in the appendices. More complete information concerning methodologies and basis for impact analysis is available in project files.

PREFERRED ALTERNATIVE

Comments:

507 Will the final EIS and the Withdrawal Team support Scenario B-1 over A-1, a mineral withdrawal without a NWM agreement?

Agencies' Response:

It is not the intent of the interdisciplinary team to support any particular alternative in the EIS. The withdrawal team that prepared the Final EIS tried to provide environmental information to the public and decision makers before a decision is made and any action taken. This is intended to help the public officials make decisions that are based on an understanding of environmental consequences.

Comment:

507 If the EIS and the Withdrawal Team support Scenario B-1, how do you justify such support when table 2-3 states; B-1 will "...increase the risk to water quality and wetlands..." compared to A-1?

Agencies' Response:

This statement is taken out of context. The statement relates to alternative facility sites that had been considered in the New World Project (NWP) PDEIS. The statement in Table 2-3 says, "Some NWP facility sites would be withdrawn; remaining available locations may increase the risk to water quality and wetlands compared to Scenario A-1."

Comment:

506 The DEIS found that water quality is already impaired from past mining activities in the area, but that improvements could be expected from reclamation of several historic mine sites. It was also indicated that such improvements were just as likely to occur under the no action alternative as the preferred alternative. However, the Withdrawal Team concluded that under the preferred alternative, "The lack of available federal land for [mining] facilities could result in environmentally less preferable development on private land." This statement is applicable to not only private lands, but unpatented mining claims as well. Therefore, the preferred alternative actually increases the potential risk associated with any future mineral development activities that would occur within the study area.

Agencies' Response:

Based on careful consideration of the anticipated environmental consequences of the alternatives and public input during scoping and in response to the Draft EIS, the agencies concluded that Alternative B best met the purpose and need for the withdrawal and should be identified as the Preferred Alternative.

CHAPTER 3 AFFECTED ENVIRONMENT AND EFFECTS ANALYSIS

Comments:

478 The stated purpose of the withdrawal is "to protect water quality and freshwater fishery resources". However, despite a general discussion of these issues there is no clear or quantitative summary of what the actual impacts of each of the alternatives would be on these resources. How would each alternative affect projected water quality standards and fisheries? Are there quantitative differences between the alternatives? Over what time periods will any projected water quality and fishery impacts be observed. The speculative nature of the agency discussion of impacts as illustrated by the continued use of...could occur...and similar wording is not adequate. There is an incredible amount of data water quality available for this area but is seems not to have been used except in the most quantitative way.

499 The Final EIS should provide much more specific information on the methods and effects of mining.

mineral processing, mine closure and reclamation. The most responsible way of providing this essential information would be to append the Draft EIS for the New world Mine project to the CCAMW Final EIS. This would present the real effects of a bonafide mining project within the area of concern rather than highly speculative mining scenarios which form the basis of the CCAMW Draft EIS.

505 ...apart from the information and analysis that was prepared in connection with the preliminary draft EIS for the New World Project, and has been incorporated into the Cooke City Area Withdrawal DEIS, the DEIS relies almost exclusively on speculation about potential impacts or broad generalities.

The DEIS attempts to justify...generalities by explaining that the DEIS evaluates a "policy" level decision concerning the appropriateness of future mining on federal lands in the area." But the fact that the DEIS evaluates a "policy" decision rather than a proposed "project," does not relax the requirements of NEPA. In fact, the evaluation of a policy decision may imply an additional level of analysis to determine the impacts of comparative policies.

Agencies' Response:

In contrast to a site-specific project proposal, a mineral withdrawal does not result in any surface disturbing effects where impacts can be quantified. Consequently, the effects of a mineral withdrawal on water quality or quantity cannot be quantified. Rather, with a mineral withdrawal, no direct mining-related changes are anticipated on lands withdrawn. Under the "No Action" alternative, effects are based on anticipated mining. Throughout the Draft EIS, the New World Project (NWP) served as an example of the potential effects of mining. The NWP PDEIS was cited extensively to portray information about the methods and effects of mining. While specific effects are portrayed for the NWP, effects for other mines are more speculative in nature, since there is no site-specific development plan to evaluate.

The addition of Appendix H, FAILURE MODES EFFECTS ANALYSIS, attempts to more specifically define risk to water quality, quantity and aquatic resources.

SURFACE AND GROUND WATER, WETLANDS, AND FLOODPLAINS

Comments:

392 The entire DEIS presents an illusion of a pristine environment untouched by man and kissed by God. The fact is the area contains ferrocrete zones that started to form with the retreat of the glaciers. Many streams have low ph levels and cemented lifeless streambeds from natural erosion of mineral deposits enhanced from early mining operations. Many of those *pristine* waters and soils contain elevated metal levels because of the deposits in their origins.

392 If this DEIS had been done correctly, it would have addressed any potential future effects with relation to the *existing* conditions. In a worst case scenario of acid rock drainage in a drainage of acid water, you cannot degrade a dead biologic system.

472 The area has many mineral deposits, and rain water seeping through the ground will still leach out many of those elements regardless of mining or no mining. In fact, Crown Butte has cleaned up much of the area which was polluted by historic mining. Many of the streams are cleaner today than they were in the past.

495 I would...suggest that the final EIS contain a summary with certain "bullets" that the layman can relate to. For example, one "bullet" might reveal that the facilities related to the New World mine would be located on Fisher Creek, which does not drain into the Park, and therefore the waters of the Park will not run red with mine pollution if the mine goes forward. Another "bullet" might explain that, even if the laws of gravity are repealed and Fisher Creek somehow is made to flow uphill into the Park, American Rivers' forecast of devastation to Yellowstone is still wrong because the aquatic health of Fisher Creek will improve if the mine is developed (DEIS page 59).

457 The Crown Butte Mining Co. along with their exploration work, did a tremendous amount of reclamation in the 1970's. The streams leading from the mine site are dead for a mile around the mine site, but this was true before mining took place. There is an out-cropping of acid rock in the area that has weathered and produced acid rock drainage for the last 8,000 years or whenever the last glaciers melted from the area. The acid rock

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drainage is a natural occurring event. The Crown Butte Mining Co. has reduced the acid rock drainage in it's reclamation efforts and would continue to reduce it further, if it were allowed to develop the mine.

505 Specifically, the EIS concludes that the water quality of many of the area streams is already impacted by natural mineralization as well as historic mining activity.

Agencies' Response:

Several comments were received indicating that existing water quality in the study area and in Yellowstone NP is impacted by natural mineralization to the extent that the incremental impacts of historical mining activities in the New World Mining District is negligible. Although specific water quality data from premining periods is not available, as mentioned in the "Surface Water Quality" section, "Affected Environment," Furniss (1996) has documented several acid seeps and springs which are naturally occurring in the upper Daisy, Fisher, and Miller Creek watersheds. It is generally recognized, however, that the rate of acid rock drainage had been greatly accelerated in the study area due to mining activities. The most water quality impacted areas (Daisy Creek and upper Fisher Creek) are located in the areas of most concentrated mining activity. As discussed in the "Environmental Effects" section of "Surface Water Quality," the New World Project poses potential water quality impacts for which a variety of mitigation techniques were being developed. At the time of the EIS suspension, a consensus was not yet reached between the agencies to the extent of potential water quality impacts or the extent or potential effectiveness of water quality mitigation.

Comments:

495 Since the major impetus for the withdrawal is said to be President Clinton's perception of a danger to the waters of Yellowstone Park, the DEIS should include a more detailed discussion of those waters. ...the politicians who are supposed to read this document before making the final decisions may be under an impression that the waters of Yellowstone Park are the most pure and pristine in America. ... the final EIS should contain graphs comparing the projected changes in the waters of Yellowstone Park under various mine scenarios to the heavy metals discharged into Park waters from the geyser basins and mud pots.

505 The EIS notes that "[n]one of the projected [water quality impacts associated with the proposed New World Project] were [determined to be] of sufficient magnitude to be considered water quality degradation in either low or high flow periods, as defined by the State of Montana." In fact, the DEIS recognizes that permitting requirements that would require treatment of poor water that is presently contributing to flows in Daisy and Fisher Creeks could improve water quality in those streams.

507 What is the PH of Soda Butte Creek as it enters Yellowstone Park?
What is the PH of Soda Butte Creek at its mouth, inside Yellowstone Park?
What is the PH of the Yellowstone River in Yellowstone Park?

507 What are the effects of the geothermal waters from Yellowstone Park on the water from Soda Butte Creek as it passes through the Park? Does the pH increase? Does the mineral content increase?

Agencies' Response:

Anderson (1993) summarizes existing water quality in Yellowstone National Park. The most concentrated area of geothermal mineral, sulfate, and nutrient impacts to surface water occurs in the upper Madison River watershed. In fact, arsenic loading in the Park causes the Madison River to exceed Montana arsenic water quality standards throughout the Madison River drainage. Several other localized areas of geothermal impact occur in streams and lakes in the Park.

The Soda Butte Creek and Lamar River drainages have relatively low amounts of geothermal impacts. Mine-related effects from the New World Mining District to water quality in Soda Butte Creek are much more significant than any geothermal effects to the stream. Water quality standards in both Wyoming and Montana consider the geothermal water quality impacts to be natural conditions not subject to numerical water quality standards and nondegradation requirements. The water quality standards and requirements, however, apply to incremental man-caused changes.

Comments:

374 We also were informed by CBMC geologists that mining and reclamation plans, if realized, will clean up the mess left by mining activities of the

19th century. Acid mine drainage from dumps will be stopped and the water quality of streams will be improved so that fish and animals can return. Trash and wood from collapsed buildings will be removed and the old townsite reclaimed. Areas of wet lands will be increased when the proposed mill is dismantled. There is no doubt that reclamation and remediation proposed by CBMC, if completed will leave the area better off than it is now. In addition, several billion dollars of wealth will have been added to the economy by the mining activity.

489 The withdrawal of federal lands from future mineral claim staking will have no impact on protecting water quality and fisheries in the Soda Butte, Clarks Fork and Stillwater drainages ...from the risk of impacts of future mining, unless it is combined with a completed action on the New World Mine (NWM) Agreement. ...without execution of the NWM Agreement, mining could proceed on lands held by Crown Butte Mines with or without the withdrawal of other federal lands. ...this proposed withdrawal would hamper the EIS process by eliminating alternate facility siting locations. It is also quite possible that mining could take place on private lands not owned by Crown Butte Mines on the large deposits discovered by Crown Butte Mines, either as a separate mining operation or under the State of Montana's Small Miners Exclusion. ...the simple act of withdrawal will do nothing that would affect existing impacts to those waters.

507 Will the goal of protecting "...water quality and fishery resources..." be fully attainable with the CCAMW, or will the CCAMW only provide partial protection, while creating new problems, such as "Lack of federal lands for mining related facilities could result in less environmentally preferred development on private land, depending on the size and location of a future mineral activity"?

505 The DEIS fails to demonstrate that the proposed withdrawal would effectively improve regional water quality or significantly benefit any other aspect of the environment. In fact, the evidence suggests that water quality improvements associated with abandoned mine reclamation would be stymied by such a withdrawal and that any mineral activities which did occur would be concentrated in a limited area, exacerbating any water quality impacts (or the risks of such impacts) which occur from activities located on those lands.

The EIS acknowledges that the proposed withdrawal without the New World Agreement would concentrate impacts on lands that remain available for mining in the Fisher and Miller Creek drainages, thereby "increasing the risk of adverse impacts to water quality" compared to the no mineral withdrawal scenario. Although the withdrawal/New World Agreement scenario assumes that no mining would occur, Map 2-4 indicates that remaining lands open to mineral entry and "likely areas [of] mineral activity" would be concentrated along limited stream segments. In other words, any impacts associated with those activities would—as with the withdrawal/no Agreement scenario—be increased when compared to the no withdrawal scenario.

Agencies' Response:

The proposed withdrawal, in and of itself, would not improve regional water quality. However, the withdrawal, if implemented, would greatly reduce the potential for mining in the study area and the associated risk of water quality problems. In the short run, the NWM Agreement and the $22.5 million available for mining rehabilitation poses the greatest potential for remedial cleanup. It is true that the availability of some favorable environmental sites for mine facilities may be reduced or eliminated by the withdrawal. Although rehabilitation planning for historical mine impacts has not been done, it is not anticipated that the withdrawal would eliminate any areas from direct or supporting reclamation treatment.

Comments:

478 The discussion of water resources environmental effects is flawed by being too general and misrepresenting the facts available from the many studies and long period of data collection. Numerous conclusions are made in this section (Chapter 3 Water Quantity), but the background data or analysis is not provided. For example, the statement is made that "...a second underground mine and open pit would further increase ground-water interception...". In order for this conclusion to be reached and to be supportable by the level of scientific analysis required for the CBMI MEPA/NEPA process much more data is required. What are the geometry, geology, hydrogeology of the areas of these hypothetical mines. Please provide a map, baseline data and the hydrogeologic analysis to allow independent review of these conclusions.

478 There is no discussion or disclosure of the risk assessment undertaken by the USFS as part of the New World EIS process. This analysis is of potentially enormous significance... I can only assume that this analysis would provide a more scientific approach to the water quality and tailings stability issues that are so generally and inadequately discussed in this document. I don't see how the claim (p 3) that as a result of the withdrawal "The risks and uncertainties related with mining-related activities would be reduced" is substantiated. What is the quantitative or other basis of this statement. A complete discussion of the risks of the CBMI proposed mine and other alternatives needs to be discussed in the withdrawal Revised DEIS.

505 The DEIS Fails To Provide an Adequate Discussion of Potential Impacts.

...the DEIS consistently discusses and projects potential risks without any supporting risk analysis. If the withdrawal decision is going to be made primarily on the basis of potential risks to the environment, then the Department should conduct a more rigorous risk assessment in order to justify that decision, and make that risk assessment available for public review and comment.

Discussion of risks associated with potential for acid rock drainage. This broad generalization of potential ARD risks is uninformative without testing of the materials in question and consideration of the potential mitigating measures or permitting requirements that might be included in a plan of operations to eliminate the risk of ARD.

505 While the DEIS concedes that the potential impacts to water quality will be small, it seeks to justify the withdrawal by suggesting that permitted facilities may fail or that water quality laws or regulations may be violated. But these potential "risks" are no more than speculation, for the DEIS also recognizes that most mining-related violations of water quality regulatory requirements over the past five years in Montana have been only "slight to moderate in seriousness." DEIS at 43, providing further evidence that the State's stringent regulatory program has been effective in adequately protecting State waters.

The DEIS summarizes the history of water-related violations in Montana and concludes that "[most recent departures are small except for a large settlement in July, 1996." DEIS at 43. In this case-at the Zortman and Landusky Mines in northern Montana-the DEIS incorrectly assumes that there were significant environmental impacts at that site. To the contrary, agency analysis of the alleged water quality violations at those mines concluded that impacts were small. That settlement involved allegations of discharges without the required MPDES permits. In 1994, BLM discussed the water quality impacts and explained "There have been no impacts to domestic water supplies. There have been no impacts to wildlife or fisheries. The ARD problem is not present in drainages that flow onto the Fort Belknap Indian Reservation. And the impacts are not prevalent beyond the mine permit boundaries. This is substantiated by the monitoring data. That does not mean the problem is not serious or does not deserve attention. The fact that violations have been issued says nothing about the impacts. A violation may be issued for simply not having a permit, regardless of the impacts."

505 The DEIS demonstrates that there is no valid environmental reason for the proposed withdrawal. The DEIS is unable to demonstrably identify any environmental resources in the study area that will be irreparably damaged by exploration or mining activities instead, it relies almost exclusively on speculative "risks" to support the proposed withdrawal. Significantly, the DEIS demonstrates that concerns about potential impacts to water quality associated with Yellowstone National Park, nearby Wilderness areas, and Wild and Scenic Rivers are unfounded.

Agencies' Response:

The EIS is intended to provide a summary of the environmental effects of the alternatives under consideration. It is not intended to justify any particular course of action. The EIS process relied upon the judgement of key resource specialists to summarize the risk associated with various aspects of mining.

Between the draft and the final EIS, the NWP "FAILURE MODES EFFECTS ANALYSIS" (FMEA) became available. This document is summarized in Appendix H and sections pertinent to "Water Quantity" and "Surface Water Quality" have been added to Chapter 3.

The FMEA quantified risk for various components or potential failure modes identified for the alternatives presented in the NWP-PDEIS. Risk is defined as the likelihood of a failure

occurring multiplied by the consequences to water quantity, quality, and/or aquatic life. The likelihood or probability of occurrence of each potential failure mode was further quantified using a 5 level scale of annual probability ranging from negligible to high probability. (Appendix H, Table H-2.)

The results of the NWP FMEA demonstrate that for most of the NWP alternatives (Appendix H, Summary Tables) the risk for flow reduction in Miller Creek is rated as low probability with low consequence, while the risk of flow reduction in Fisher Creek is rated as very low during construction, operation, decommissioning, and post mining land use. The FMEA also includes a risk management plan which summarizes risk issues and potential compensation measures by NWP alternative.

The results of the FMEA demonstrate that risk varies substantially among alternatives. Risk for various failure modes for all alternatives varies from very low likelihood with low consequences, to low likelihood with extreme consequences. The off-site tailings disposal alternatives were rated as very low to moderate likelihood of failure occurrence with only low consequences with relatively few failure modes identified. The number of potential failure modes increased with other alternatives, as did the likelihood of occurrence and severity of consequences. The FMEA also includes a risk management plan which summarizes risk issues and potential compensation measures by NWP alternative.

Comment:

478 The stated purpose of the withdrawal is "to protect water quality and freshwater fishery resources". However, despite a general discussion of these issues there is no clear or quantitative summary of what the actual impacts of each of the alternatives would be on these resources. How would each alternative affect projected water quality standards and fisheries? Are there quantitative differences between the alternatives? Over what time periods will any projected water quality and fishery impacts be observed. The speculative nature of the agency discussion of impacts as illustrated by the continued use of...could occur...and similar wording is not adequate. There is an incredible amount of water quality data available for this area but it seems not to have been used except in the most quantitative way.

Agencies' Response:

Much of the water resource effects description for CCAMW alternatives was based on relative impacts compared to the NWP PDEIS, since the NWP data and analysis is the only local mine effects quantitative information available. The remainder of the mineral forecast and mineral scenario "facilities" effect descriptions, such as the additional underground mine or surface mine, were written by forecasting their potential anticipated effects relative to the NWP. Since the mineral forecast contains no specific proposals, locations, or timeframes for additional mines, it was not feasible to provide a definitive quantitative analysis of specific water quality effects of additional mines in the various Scenarios.

Comments:

439 Page 32, Water Quality Affected Environment, General Description of Watersheds, 2nd paragraph. — The Broadwater River is mentioned on page 33, but not here, as one of the steams in the study area. Nor is Lady of the Lake Creek and its drainage area given here, although it is discussed in the Water Right Claims section on page 35. These streams and their drainage areas should be listed here.

505 Map 3-2 is meant to augment the discussion in the text by portraying the pH levels in area streams, yet not all of the streams discussed in the text (Daisy Creek, for example) are marked on the map. Map 3-3 also fails to identify some of the drainages and streams discussed in the text. This problem occurs throughout the DEIS as some drainages are apparently not identified on the base map.

505 Similarly, while the numerous maps in the DEIS could be very helpful, critical information is omitted. For example, Map 3-2 is meant to augment the discussion in the text by portraying the pH levels in area streams, yet not all of the streams discussed in the text (Daisy Creek, for example) are marked on the map. Map 3-3 also fails to identify some of the drainages and streams discussed in the text. This problem occurs throughout the DEIS as some drainages are apparently not identified on the base map. It is particularly troubling, however, in these sections because the maps are referenced by the text, yet because they are incomplete, the maps do not illustrate the points made in the textual discussion.

Agencies' Response:

The maps in the Final EIS have been updated to include labels for the Broadwater River, Lady of the Lake Creek, Sedge Creek, and Daisy Creek.

Comment:

360 The "wetlands" between Cooke City and Silver Gate are not on the wetlands map. Are they considered "fens"? These are prime Moose habitat and migratory bird nesting areas.

Agencies' Response:

Map 3-1 does not display the extensive willow bottom and forested riverine wetlands which occur along Soda Butte Creek between Cooke City and Silvergate. The map also does not show other non-Crown Butte inventoried (NWP PDEIS) wetlands in the study area, such as in Sedge Creek upstream of Kersey Lake. Map 3-1 was developed using the NWP PDEIS wetland maps, hence the "inventoried wetlands" legend. The "Wetlands and Floodplains," "Effected Environment" section was adjusted to clarify the lack of wetland map information for non-Crown Butte inventoried areas.

Comment:

439 page 43, Effects of Alternative B-1, 2nd paragraph—In contrast to what is implied here, the NWM Agreement would not be implemented under Alternative B-1. Yet this paragraph states that the NWM Agreement would reduce the potential for mining related impacts and that the New World Mine would not be constructed.

Agencies' Response:

The paragraph in the above referenced section was included in error and has been deleted.

Comment:

360 The flooding east of Cooke City on Highway 212 and flooding in the Soda Butte Creek/Silver Gate area in 95 and 96 will probably be repeated in 1997 due to the large amount of snowfall. Heavy above normal snowfall were not considered seriously in the NWM application or PDEIS or mentioned in your Draft, in connection with flooding.

Not much mention was made of major flooding and mudslides in your draft. The most serious slide was near the NE Gate in 1996. Another near Soda Butte camp ground 95 and 96 and 3rd one 1994 near the Mt Republic Church. These 3 can probably be associated with the fires of 88 and logging but could mining in the NWM/withdrawal area add to the mudslide problem?

Agencies' Response:

Steep terrain, heavy snowpacks, and localized intensive rainstorms result in frequent debris flows and mudslides in the study area. Highway 212 culverts and bridges are commonly impacted with mass wasting debris. Snowmelt runoff in 1996 resulted in several mudslides along Highway 212 and an flooded section of the highway above Cooke City for several days. The "Water Quality," "Affected Environment" section was changed to reflect the mass wasting and flooding potential in the study area. Most of the mass wasting occurs from steep unroaded areas; although, a fill slope failure on the Miller Creek road closed the road with deposition down to Highway 212 in 1996. Mining in the study area could add to the mudslide problems primarily by road building and associated surface de-stabilization and capture and concentration of overland flow to unstable areas.

478 I found no significant discussion of the water quality, fishery or other impacts of the McLaren tailings near Cooke City. These tailings, which in my view, constitute the single greatest long term risk to Soda Butte Creek water quality need to be discussed relative to the impacts of each alternative.

Agencies' Response:

Reclamation activities, such as clean up of the McLaren tailings are beyond the scope of this analysis. Water quality and aquatic environment effects from the McLaren tailings are discussed in Chapter 3 of the Final EIS.

Comment:

500 Surface and Groundwater/Environmental Effects of Alternative A-1, page 43: In the summary for this section on page 43, the author is describing the noncompliance violations issued by the Montana DEQ/Hardrock Mines Division. The conclusion that is drawn is that there were relatively few violations for spills, leaks, surface discharges, etc., during the period of 1991-1996.

For much of this period, the responsibility for enforcing water quality violations was the Department of Health and Environmental Sciences. It is not apparent from the comments whether the author was referring only to actions taken by DEQ/Hardrock Mining Bureau of to DHES before it transferred this authority to DEQ.

However, during the period cited, 1991-1996, DHES was investigated and soundly criticized for not carrying out its responsibilities to enforce violations of water quality standards. Mining companies were cited as some of the polluters for whom enforcement was not diligently pursued.

Therefore, to assert that because there were relatively few, and insignificant, fines levied during this period is misleading.

Agencies' Response:

The Surface Water Quality section, Alternative A Scenario A-1, was amended to include a statement that the Hard-Rock Division has been criticized for not taking enforcement action against some mines for water quality violations.

Comment:

439 page 43, column 1, 2nd paragraph, discussion of environmental effects on surface water quality— — The DEIS should have pointed out that failures of mitigation measures and departures from water quality standards have also occurred in areas other than Montana. These include the failures in recent years of tailings retaining impoundments similar to the operation proposed for the New World Mine at the Summitville Mine in Colorado, the Omai Gold Mine in Guyana, and the Brewer Gold Mine in South Carolina.

Agencies' Response:

The EIS identifies mining-related risk including failed mitigation and departure from standards. Appendix H, FAILURE MODES EFFECTS ANALYSIS, serves as an example of mining-related risk from NWP alternatives to water and aquatic resources. Discussion of other mine failures would require in-depth discussion of the probable causes, history of the operation and existing regulatory climate. That is beyond the scope of this analysis. Other commentors pointed out examples of successful mines.

Comment:

490 In the Wetlands and Floodplains Affected Environment section, an entire paragraph (page 45, third complete paragraph) is devoted to the explanation of riffle/pool complexes. Riffles and pools occur in streams, not in wetlands or floodplains. Therefore, this discussion would be more appropriate for another section.

Agencies' Response:

The paragraph on riffle and pool complexes was included in the "WETLANDS AND FLOODPLAINS" section, because riffle and pool complexes, along with wetlands, are categorized as "special aquatic sites" according to Clean Water Act regulations. The regulatory mechanism to delineate and regulate both wetlands and pool and riffle complexes is derived from Section 404 of the Clean Water Act. Therefore wetlands and pool and riffle complexes are usually addressed in the same section in EIS's.

Comment:

505 In other instances, the DEIS omits information that is available and necessary for a complete understanding of the issues. For example, in the discussion of wetlands at page 46, the DEIS notes that the "COE, NPS and EPA....did not concur that the wetland function had been sufficiently identified." That statement is correct, but incomplete, for the joint USFS and MDEQ EIS team for the NWP EIS explicitly rejected that concern and determined to proceed with the DEIS notwithstanding those comments.

Agencies' Response:

The contention that the NWP PDEIS explicitly rejected the Corp of Engineers, National Park Service, and EPA concerns about wetland function identification is inaccurate. During August 1996, just a week before the NWM Agreement was announced, the COE, NPS, EPA, USFS, several state agencies, and Crown Butte mine consultants participated in an on-site field review. The review examined several of the NWP wetland sites and developed a tentative process of wetland function delineation for the NWP EIS. A week later the EIS was put on hold with the announcement of the NWM Agreement.

Comment:

416 The effects of future hardrock mining, that could occur on federal lands if mineral withdrawal is not accomplished, include increased acid-rock drainage, the potential for ground-water contamination, the potential hazards from failure to tailings impoundments.

Agencies' Response:

These effects are discussed in Chapter 3 under "SURFACE AND GROUNDWATER, WETLANDS AND FLOODPLAINS," and under "AQUATIC RESOURCES." "Appendix H,

FAILURE MODES EFFECTS ANALYSIS" has also been added in the Final EIS to address the "risks" associated with mining.

GENERAL COMMENTS/OPINIONS EXPRESSED ABOUT SURFACE AND GROUND WATER, WETLANDS AND FLOODPLAINS

Comments:

433 It is my feeling that humans pollute the streams by careless disposal of human waste which is more harmful than anything else to the fish population. Mining Co. would prevent this with their precautions.

427 It seems a shame no clean up work is presently anticipated for the source of water pollution located a the East end of Cooke City. Otherwise, the planned withdrawal and Agreement seem well designed to restore the area to the highest (environmental) level possible given current habitation. **(Also comment letters 328, 342, 337)**

416 Without doubt the values associated with water quality and ecosystem integrity far outweigh the "values" associated with the conversion of more public land to private mining ventures.

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

AQUATIC RESOURCES

Comment:

490 In the Aquatic Resources section, Chapters 7 and 8 of the NWP PDEIS are referenced several times. However, I was only able to find a citation for Chapter 8 in the References section. A citation needs to be added for Chapter 7 in the references section, particularly since there are multiple preliminary draft EISs for the New World Mine Project.

Agencies' Response:

You are correct; Chapter 7 has been added to this reference.

Comment:

490 I was pleased to read that monitoring studies were conducted using different species of biological indicator organisms (algae, macroinvertebrates, and fish). The list which discusses the reasons why algae are used for sampling is a very good item to include for readers not familiar with biological sampling. However, in order to maintain parallelism among sections, similar lists should be included for invertebrates and fish. The EPA publication, Rapid Bioassessment Protocols, provides concise lists on page 53 which state the advantages for fish and invertebrate sampling studies. These lists could be paraphrased for inclusion in this EIS.

Agencies' Response:

The following information has been added to the "Invertebrates" paragraph (Aquatic Biology, Clarks Fork River Drainage) and the "Fish" paragraph (Aquatic Biology, Clarks Fork River Drainage) in Chapter 3 of the Final EIS:

"Invertebrates. Aquatic invertebrates are also commonly used to monitor stream systems because:

-they have limited migration patterns or sessile mode of life, and thus are particularly well suited for assessing site-specific impacts;

-they integrate the effects of short-term environmental variation, and sensitive life stages respond quickly to stress;

-they are relatively easy to identify to family and lower taxonomic levels;

-sampling is relatively easy, and has no detrimental effect on the resident biota;

-they serve as a primary food source for fish; and

-they are more abundant than fish (Plafkin et al., 1989).

Fish. Fish are routinely used to monitor stream systems because:

-they are good indicators of long-term effects and broad habitat conditions;

-they are at the top of the aquatic food chain and tend to integrate effects of lower trophic levels;

-they are consumed by humans, making them important subjects in assessing contamination;

-they are relatively easy to collect and identify to the species level, and the environmental requirements of individual species are comparatively well known; and

-aquatic life uses (water quality standards) are typically characterized in terms of fisheries (Plafkin et al., 1989)."

Comment:

439 page 50, Physical Environment, Clarks Fork of the Yellowstone River Drainage, section on Sediment——It is incorrect to include the 1988 fires among the factors that have increased sediment yield above natural levels. The 1988 fires and associated changes in sediment loads are natural, cyclical phenomena.

Agencies' Response:

A sentence has been added:

"Fires in 1988 have also increased sediment yield to Fisher Creek and the Clarks Fork River."

Comments:

439 The DEIS is deficient for not discussing the present and reasonably and foreseeable activities and cumulative effects that the Cooke City and Silver Gate developed areas have on the water quality and aquatic resources of Soda Butte Creek. Nor does the DEIS discuss the measures that have been or could be taken to ensure that present and anticipated growth in these developed areas due to mining or other activities does not adversely affect Soda Butte Creek in Yellowstone National Park.

478 I could find no discussion of the water quality impacts of the tourist and recreation community that the withdrawal is supposedly trying to protect: I (as well as numerous agency personnel) have observed raw sewage flowing over the ground in Cooke City as recently as 1995. Without providing a discussion of the specific impacts of each of the alternatives to the water quality and fisheries how can the public assess the possible impacts of the withdrawal. What would water quality be both with and without a withdrawal? What are the tourist and recreation impacts to area fishery resources and how would the various alternatives quantitatively impact the fish population in Soda Butte, Fisher and Stillwater River?

439 The DEIS fails to discuss or even mention the impacts (good, bad, or neutral) that the Cooke City and Silver Gate developed areas have on Soda Butte Creek, which flows through the center of these areas. Nor does the DEIS indicate the measures that have been or could be taken to maintain the quality of the stream through the development areas. This should be an integral part of the description of the environment section and of the discussion of past, present, and reasonably foreseeable activities and cumulative effects. This is especially important in light of the statements on pages 146 (1st column, last paragraph) and 147 (2nd column 4th paragraph) regarding the poor status of the present septic tank method of sewage disposal and the natural limitations on the ability of the town sites and surrounding area to adequately handle septic tank type of sewage disposal.

Agencies' Response:

A section has been added to the Surface Water Quality, Affected Environment to note that some sewage and nutrient leakage from septic systems in Silver Gate and Cooke City probably impacts Soda Butte Creek. Wording was also added to the Environmental Effects section for Surface Water Quality, Alternative A, Scenario A-1 to clarify that increasing recreational and residential use and development in the Silver Gate and Cooke City areas, as summarized in Appendix C, pose additional cumulative water quality impacts to Soda Butte Creek. These additional impacts could include accelerated sediment from residential and road construction, additional septic system leakage, and stormwater runoff. Residential development in the study area most frequently occurs on a unit by unit basis with no water quality impact regulation except for building permits and codes. Cumulative impacts of septic systems in Soda Butte Creek could become a problem unless a central sewage treatment facility is constructed. However, the overall potential for residential development in the study area is constrained by limited suitable private land and domestic water.

The following information has been added to the Water Quality section of Chapter 3:

"Residential drainfields along Soda Butte Creek throughout Cooke City and Silver Gate likely increase nutrient loading to the stream. Periphyton indices for lower Soda Butte Creek (downstream of the McLaren tailings) suggest higher levels of nutrients compared with upstream sites."

The following text has been added to the section, Yellowstone National Park, subsection on Cumulative Effects Common to All Alternatives:

"Commercial and residential drainfields along Soda Butte Creek have increased nutrient levels in the steam."

The last sentence in this section has also been modified to read:

"Future highway reconstruction could induce temporary sediment increases, and future residential development along Soda Butte Creek could further increase nutrient levels in the stream."

Discussing measures that could be taken to ensure that increased nutrient enrichment does not occur in the future is beyond the scope of this EIS. Therefore, no modification was made to the Final EIS to address that portion of the comment.

Comment:

507 If Federal and State Laws are in place to prevent the environmental damage caused by mining activities dating from the 1860's from occurring in a modern mining operation today, have these laws been successful in improving and protecting water quality and fishery resources?

Agencies' Response:

Federal and State water quality laws and standards are designed to protect aquatic resources. Therefore, when standards are met, effects are within established threshholds. When violations occur there may or may not be adverse effects depending on the nature and severity of the violation. Noncompliance violations that have occurred in Montana during the period between 1991-1996 are summarized in the section on "Environmental Effects," subsection "Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Agreement Not Implemented" in Chapter 3 of the Final EIS. Violators are required to rectify the problem and/or pay a monetary penalty, depending on the severity of the noncompliance.

Comment:

505 While new mining projects are unlikely to harm water quality in the study area, the DEIS recognizes that "reclamation of historic mining activities ... could greatly improve water quality in study area streams." Yet, the proposed withdrawal would not only preclude future mineral development, but could also block or delay reclamation of abandoned mines, many of which may no longer be attributable to an existing mining entity. In fact, Appendix C clarifies that reclamation of the McLaren and Como Pits would not occur without the New World Agreement. Consequently, the proposed withdrawal coupled with the failure of the parties to successfully implement that Agreement would virtually eliminate the prospects for water quality improvements associated with the expedited reclamation of many of the historic mine locations in the District. Without completion of the New World Agreement or new mineral development, the historic mining properties on federal lands would be subject to reclamation by the federal government rather than the expedited reclamation likely to occur as part of a new mining development.

Agencies' Response:

Mine reclamation activities for Scenario A-1 and B-1 would include plugging or treating water from Glengarry adit and Gold Dust adit (see Appendix C, SUMMARY OF ASSUMPTIONS). Mine reclamation activities for Scenarios A-2 and B-2 would include reclaiming McLaren and Como pits, plugging or treating water from Glengarry adit and Gold Dust adit, abandoning and reshaping road beds, reclaiming abandoned mine exploration, and reclaiming old tailings piles in Fisher Creek. Thus, reclamation is assumed to occur under all alternatives.

Reclamation activities and subsequent potential water quality improvements are described for each alternative. Therefore, no text changes were made.

Comment:

500 Aquatic Resources/Aquatic Biology, page 53: The third paragraph on this page starts with the statement "Periphyton from Fisher Creek, Lady of the Lake Creek, and the Clarks Fork River were rated moderate to severe for overall impairment, possibly as a result of elevated levels of heavy metals." There are no documented heavy metals or other contamination in Lady of the Lake Creek. In addition, Map 3-4 depicts Lady of the Lake Creek as "good or excellent" for the condition of the biotic community.

Is it possible that the author is referring to Daisy Creek or the Stillwater River? If this is indeed true for Lady of the Lake Creek, then more explanation should be given. In all other capacities, Lady of the Lake Creek appears to be in excellent condition.

Agencies' Response:

"Lady of the Lake Creek" has been deleted from this paragraph ("Aquatic Biology, Clarks Fork Yellowstone River Drainage) in the Final

EIS. In addition, the following text has been added to this paragraph:

"Periphyton indices for Lady of the Lake Creek also indicated a stressed community. Since metal concentrations have not been reported to affect this system, low values are most likely the result of natural stressors described above."

RECREATION, SCENIC, AND SPECIAL AREAS INCLUDING YELLOWSTONE NATIONAL PARK

RECREATION

Comment:

505 The DEIS discusses the potential impacts on recreation resources, but fails to account for the potential environmental impacts associated with already increasing recreational use of the study area. It is possible that some of the risks of environmental impacts that will be assuredly eliminated by the withdrawal will be offset by increasing impacts as a result of increasing recreational use. See DEIS at 64-75.

Agencies' Response:

Cumulative effects analysis which considers impacts from increasing recreation use were added to Chapter 3, Recreation. Cumulative effects of increasing recreation use was also considered under Wildlife, Aquatic Resources, Social, and Economics sections.

Comment:

488 While a portion of the area proposed for withdrawal is, in fact, quite beautiful, the area is not "pristine", or untouched. A great portion of the area has incurred industrial development in earlier years by mining.

Agencies' Response:

Please refer to Map 3-7, Recreation Opportunity Settings and Scenic Integrity Levels. The composite of past mining activity evidence is at Henderson Mountain, Fisher and Miller Creeks. The scenic integrity level for this area is moderate, that is, there are noticeable deviations but they remain visually subordinate to the landscape's characteristics. The recreation opportunity setting is roaded with cultural and historical sites that have recreational interest and value. As resources, these sites represent events and periods of human activities in this area. As shown on Map 3-7, outside the Lulu Pass/Daisy Pass area, and the US 212 corridor, the remainder of the area has high to very high scenic integrity levels.

Comment:

439 page 66, Backpacking and Backcountry Use——For full disclosure, the DEIS should have indicated the miles of USFS maintained system trails and the miles of such trails that are open to motorized use.

Agencies' Response:

A section on "Travel Management" has been added to describe what areas, roads, and trails are open to motorized use. There are approximately 12 miles of Forest Service system trails in the study area.

Comment:

439 page 66, Driving for Pleasure——For full disclosure, the DEIS should have indicated the miles of roads suitable for pleasure driving by conventional passenger vehicles.

Agencies' Response:

A sentence has been added to this section as follows:

"Eight miles of US 212 and the Miller Creek portion of the Lulu Pass/Daisy Pass road are suitable for conventional passenger vehicles."

Comment:

439 page 67, Table 3.5 Key Attractions and Recreational Opportunities, Yellowstone National Park—— The DEIS should have included cross-country skiing and snowmobiling in the list of primary activities in Yellowstone National Park.

Agencies' Response:

Cross country skiing and snowmobiling were added to Table 3-5.

Comment:

439 pages 69-70, Semi-primitive Wildland Settings——The DEIS should have explicitly indicated that the study area does not include any Semi-primitive Nonmotorized settings, only Semi-primitive Motorized settings according to Map 3-7. The statement "motorized use is generally limited to low standard roads." is ambiguous. The DEIS should have specified the extent that these semi-primitive settings are open to and used by off-road

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and off-trail motorized wheeled vehicles and snowmobiles. The 4 designated roadless areas and their acreages should also have been described here or elsewhere in this description of the affected recreational environment, since these roadless areas are referred to later in the DEIS (e.g. page 74, 2nd column, 2nd paragraph).

Agencies' Response:

The following clarification has been added in the Final EIS:

"Because portions of these areas are accessed by motorized routes, and all of the settings are open to snowmobiling, the areas are considered semi-primitive, motorized settings."

The following section on Travel Management has also been added to the Affected Environment:

"Motorized vehicle access in and around the study area is managed by the Gallatin National Forest. Restrictions on motorized use are displayed on the 1996 Gallatin National Forest Visitors' Map.

National Forest lands north of US 212 are closed year-round to off-road motor vehicle use (excluding snowmobiles) to provide for wildlife habitat security. Motorized vehicles are restricted to designated routes, including the Kersey Lake, Goose Lake, Lake Abundance, and Lulu/Daisy Pass roads. Trails such as Lady of the Lake, Wolverine Pass, Clarks Fork and Upper Stillwater are closed to motorized use. There are no restrictions on snowmobile use within the study area.

There are no area closures or other travel plan restrictions for National Forest lands south of US 212."

Comment:

374 I had an opportunity to visit and tour the area in September 1995, accompanied by project geologist of Crown Butte Mining Company (CBMC). Our tour took us up Daisy Pass Road to Fisher Mountain, returning by Fisher Creek, site of the proposed mill. On the weekend of our visit, elk hunting season was in full swing. Hunters were camped out in mobile homes along the road. They had hauled up horse trailers, trail bikes and all sorts of camping equipment. The road was gravel and well maintained. Despite the narrative of the EIS, my visit was not a wilderness experience. The area is well developed for multiple use. Impact of people on the area is considerable. Yes, the area is scenic but in my mind it does not qualify for wilderness as impact of hunters and weekend campers is significant.

Agencies' Response:

The greater number and greater concentration of recreationists are present and more obvious during hunting season. This is common at many hunting access places. This loop route around Henderson Mountain is inventoried as a roaded recreation opportunity setting; one expects finding this place with many recreationist pursuing activities and camping. The mineral withdrawal is a separate and distinct action from wilderness designation.

Comment:

439 page 72, 2nd paragraph, 2nd sentence——The meaning of "non-residency rules" is unclear. Does this mean restrictions on the length of time that people can camp or live on USFS lands? Does it apply to private lands in the study area and elsewhere in the region?

Agencies' Response:

The following clarification has been added to this section in the Final EIS:

"The non-residence rule restricts most Crown Butte mine employees and contractors from establishing temporary or permanent residences in the Cooke City-Sunlight Basin corridor. In addition, a clause would be included in Crown Butte's employment contract that would prohibit workers from camping on National Forest lands other than those approved by the Forest Service."

Comment:

439 page 74, Effects of Alternative B-1, 3rd paragraph——The DEIS should have specified here the acreage of private land and unpatented mining claims in the central portion of the study area that would be affected. If I have interpreted the DEIS and Map 2-2 correctly, this would amount to 4,180 acres of federal land and 1,740 acres of private land.

Response:

Table 2-1 displays the acres available for each Scenario. For Scenario B-1, 4,240 acres of federal land and 4,160 acres of private land are

available for mining. The exact acreage within the central portion of the study area has not been determined.

Comment:

472 The area in question is a great natural asset. It has many hiking trails, snowmobile trails, and is a tourist attraction. The mine buildings would not be seen except from a few locations. In the vicinity there would still be hundreds of miles of roads and trails where one could go to be in beautiful country. If the tourists and locals can put up with the freeway cloverleafs and large parking lots around Old Faithful in Yellowstone NP, they should be able to look past the mining operations as well.

Agencies' Response:

Depending on future mine locations in the area, mine buildings, earthen structures, and mine roads would be visible from one to all of numerous key observation points (KOP's). (Please see Table 3-7 in the Final EIS for the location and use of KOP's.) The Old Faithful development in YNP and a mining development have different purposes. Old Faithful is an example of a more highly developed recreation site; it is developed solely for the support and administration of recreational activities. The facilities are designed for recreational user safety, comfort and convenience. In places, the facility is refined and even complex, but, it is complimentary to the site and recreational experiences. By comparison, mine sites and their structures are developed solely for industrial mining. Recreational uses are commonly excluded.

Comments:

439 page 70, Effects of Alternative A-1, 2nd paragraph——The DEIS understates the impact of mineral development on the traditional recreational values described in the DEIS. Clearly, development of mining activities would adversely effect rather than would most likely have an adverse effect on recreation activities in the vicinity of future mines.

439 page 71, Conflict with Mining Activities and Facilities——Again the DEIS downplays these conflicts. Mining activities and facilities would instead of could have direct effects on wildland recreational resources and opportunities. And the quality of the snowmobiling experience due to the impacts of mining activities on roads normally groomed for snowmobiles would change rather than may change as stated in the 2nd paragraph of this section.

439 page 72, Effects of Alternative A-1 on Area Highways, 2nd paragraph——Conflicts between recreational traffic and large truck traffic from mining activities on US 212 and Wyoming 296, etc., would make recreational traveling and viewing less acceptable and safe rather than may make it so, as stated in the DEIS.

439 page 75, conclusion, 3rd paragraph——If mineral development is likely to occur in the central portion of the study area under Alternative B-1, as stated here. This would rather than may affect recreation similar to Scenario A-1.

Response:

These changes have been made in the Final EIS.

GENERAL COMMENTS/OPINIONS EXPRESSED ABOUT RECREATION

Comment:

305 You may also consider the fact that much of Americas foreign tourist industry is based on our areas of scenic beauty. Tourists come from the crowded cities of Europe and Asia to see the wide open wild places of the American West. The wilderness areas of many other countries have been or are being destroyed by mineral extraction, centuries of development, and population redistribution plans. Lets protect the little that remains of our wilderness. The value of scenic land left in its natural state far exceeds the value of the minerals that can be extracted from it.

324 It is one of the most popular recreation areas near Yellowstone. It would be a tragedy if we stave off the New World Mine only to find another mine development nearby.

350 Protection of the recreational opportunities and wilderness values is (or should be) given the highest priority in land management.

380 It also straddles the Absaroka-Beartooth Wilderness Area, and is a highly-prized recreation area. Withdrawal of these lands from mineral development will assure the future of this special place.

453 There will remain hundreds of square miles of natural recreation for locals and tourists. The mining operation will be seen only from a few locations. **(Also comment letters 459-466, 470, 492)**

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

SCENIC INTEGRITY

Comments:

500 Scenic Integrity, p. 75: While the scenic quality in portions of the analysis area has already been degraded by previous mining operations, we hope that the long term cleanup effort will at least improve some of the currently visible scars.

392 This withdrawal can't protect visual resources unless open pits, acid drainage, tailings ponds, smelter waste and waste rock piles are the goal. Montana's laws provide for cleanup of old problems through permitting of new operations, with no cost to the public. The area would have higher visual values *after* a permitted mining operation than what presently exists.

Agencies' Response:

A section has been added on "Cumulative Effects Common to All Alternatives" for "Scenic Integrity." Reclamation would occur under any of the alternatives. If reclamation leads to successful revegetation of the Como and McLaren Pits, scenic quality would improve.

Comments:

508 It should be emphasized that this is a location in the midst of spectacular designated wilderness areas and very near to one of the world's natural jewels, Yellowstone National Park. Subjective and esthetic criteria are appropriate factors in the case of this withdrawal because of the unusual value of the surrounding wilderness. The negative esthetic effects of a mine in view of Yellowstone should not be minimized.

439 page 75, Scenic Integrity, Viewer Sensitivity, 2nd paragraph——The DEIS should have pointed out that the study area is nearly surrounded by lands that are formally dedicated to maintaining the highest level of scenic integrity (designated wilderness on the national forests and recommended wilderness in Yellowstone National Park); whereas current USFS management direction allows industrial activities and commodity uses in the study area enclave that could have major impacts on the continuity of the otherwise high level of scenic integrity of the region.

Agencies' Response:

Scenic Integrity is an important issue as evidenced by this section of the EIS. The Secretary will consider the importance of scenic quality, as well as potential effects to scenic quality, when making a decision. Scenic integrity levels are qualitative ratings, as compared to quantitative ratings, for the extent that a landscape's characteristics are complete and intact. The acceptable ratings range from very high to very low.

In Chapter 3, "Scenic Integrity," "Viewer Sensitivity", a sentence has been added as follows:

"The surrounding designated wilderness and Yellowstone NP are managed to preserve a very high or high scenic integrity level." For visual resource management of the study area please refer to Map 3-8, "Visual Quality Objectives."

Comment:

439 page 78, Table 3-8: Summary of recreation and scenic settings in study area, recreation opportunity spectrum for the Republic/Woody Creek area——The DEIS should have mentioned here that not only Republic Mountain, but the adjacent area in Yellowstone National Park has been recommended for wilderness.

Agencies' Response:

The following information has been added to Table 3-8 in the Final EIS:

"Republic Mountain is adjacent to the North Absaroka Wilderness and to proposed Wilderness in Yellowstone NP."

Comment:

439 page 81, Effects of Alternative A-1, 2nd paragraph——The DEIS should have pointed out that lands available for mineral entry have very high scenic integrity, including roadless lands adjacent to wilderness in the national forests or recommended wilderness in Yellowstone National Park.

Agencies' Response:

This comment is addressed in the "Introduction" to Chapter 1 of the Final EIS. A sentence

has also been added to the section on "View Sensitivity" in response to this comment.

Comment:

394 After reading the summary carefully, twice, I decided I would add some information regarding the scenic integrity analysis found on page 19 of the summary. The last sentence says "the study area is also briefly visible from U.S. 212 near the northeast entrance to the Park". However, with a knowledgeable eye the study area is plainly visible from the summit of the Beartooth Pass, the Scenic View of Sunlight Basin and Pilot Overlook and by the Aspen grouping above the intersection. This would be visible to the uneducated eye very dramatically if it were lighted, which could happen. As far as I am concerned mining in this area would be devastating to the pristine, untouched, overwhelming view that now exists. For all we know with the area lighted, it would be visible during the day to the untrained eyes.

Agencies' Response:

Pilot Overlook was added to Table 3-7: "Location and Use of Key Observation Points." The analysis disclosed in the Final EIS utilized three observation points on the Beartooth Highway. While the study area is visible from Beartooth Pass, potential mining facilities and disturbances are not likely to be visible from this distance.

YELLOWSTONE NATIONAL PARK

Comment:

439 page 84, Yellowstone National Park, Affected Environment, 1st paragraph——The DEIS should have mentioned that all the area within Yellowstone National Park, except for a narrow corridor along the highway and the developments at the East Entrance, have been recommended for addition to the National Wilderness Preservation system and is managed as wilderness until Congress and the President act on the recommendation.

Reference: U.S. National Park Service. 1972. Wilderness recommendation, Yellowstone National Park. 29 pages plus 12 unnumbered pages of response letters from federal, state, and county agencies.

Agencies' Response:

These comments have been incorporated into Chapter 3, "RECREATION, SCENIC, AND SPECIAL AREAS INCLUDING YELLOWSTONE NATIONAL PARK," under the "Affected Environment" description for Yellowstone National Park.

Comments:

488 World Heritage Site and Biosphere Reserve As incorrectly implied in this section of the DEIS, the affected area of this withdrawal has not been designated as a Biosphere Reserve. To imply that the area is within a Biosphere Reserve, as indicated on page 19 of the Summary and page 89 of the text is incorrect.

The circumstances surrounding the decision of the World Heritage Committee designating Yellowstone National Park a "World Heritage in Danger" was highly suspect, manipulated by both the Administration and special interest groups opposed to the New World Gold Project, a circumvention of the National Environmental Policy Act (NEPA) under which the current DEIS process is undertaken, and not in the best interest of the nation. To use the "World Heritage in Danger" designation as justification for the proposed mineral withdrawal is both after-the-fact and improper.

437 We suggest that the area's being located adjacent to but outside the Yellowstone Biosphere Reserve and World Heritage Site is without standing in reaching a decision. The Yellowstone boundaries are clearly defined and its scenic and geologic features are adequately provided for within its boundaries. The area outside must remain a part of the operating America.

Agencies' Response:

Under "Affected Environment" for Yellowstone National Park, it is clearly stated that the Biosphere Reserve designation applies to Yellowstone NP. The sentence referred to in commentor letter 488 has been modified as follows:

"There are no effects anticipated on the Biosphere Reserve designation of Yellowstone National Park."

The Park's status as a World Heritage Site and Biosphere Reserve was a public issue that required consideration in the EIS. Water from the study area flows into Yellowstone NP, and wildlife freely move between the study area and the Park. The EIS draws no conclusions con-

cerning potential changes in the status of the Park as a World Heritage Site.

Comment:

488 Your statement on page 89 that a major mining operation developed in the Henderson Mountain would affect Soda Butte Creek draining into Yellowstone Park is, as stated, incorrect. Any such effect would be totally dependent upon siting of such mining operations, and in the case of the New World Project as proposed by Crown Butte would not affect the drainage into Soda Butte Creek.

Agencies' Response:

As stated under the "Environmental Effects" for "Surface Water Quality," (which also addresses ground water), Scenario A-1:

"The quality of ground water flow and springs from Henderson Mountain could be affected by the NWP. Mine excavation, blasting, and backfilling would affect ground water within and down gradient of Henderson Mountain. Acid rock drainage might result from mine excavation due to exposure of sulfide minerals to oxygen and water."

A major portion of the underground workings for the NWP are within the Miller Creek drainage. Some of the springs on Henderson Mountain drain into Miller Creek which is a tributary to Soda Butte Creek.

The effect of other potential mining operations on Soda Butte Creek, and subsequently, Yellowstone National Park water resources, is dependent upon the location of the mine facility (including underground workings, geology, and topography).

Comment:

439 page 85, Yellowstone National Park, Scenic Integrity——The DEIS should have pointed out that the study area is visible from some higher elevation locations within recommended wilderness along the northeast boundary of the Park.

Agencies' Response:

This suggestion was incorporated into the text.

Comment:

439 page 88, Yellowstone National Park, Cumulative Effects Common to All Scenarios, 1st paragraph——The DEIS should have pointed out that under Alternatives A-1 and B-1, in which US 212 and Wyoming 296 would be open year round, this route could be used by commercial traffic serving the Cooke City/Silver Gate area instead of going through Yellowstone National Park. Thus the National Park Service could justifiably require that such commercial traffic use that route rather than through Yellowstone National Park.

Agencies' Response:

Your suggestion was incorporated into "Cumulative Effects Common to All Scenarios" and into the "Summary of Effects for Other Yellowstone NP Issues" under the Chapter 3 discussion on "Yellowstone National Park."

Comment:

439 page 88, Yellowstone National Park, Cumulative Effects Common to All Scenarios, 2nd paragraph——The DEIS should have listed the specific ascertained and potential threats to the park cited by the World Heritage Committee that would remain for the near future, even in the absence of future mining.

Agencies' Response:

An additional sentence has been added: "These threats relate to the endemic Yellowstone cutthroat trout, sewage leaks and water contamination in certain areas of the Park, road construction and visitor pressures, and threats to the bison population posed by brucellosis control measures."

GENERAL COMMENTS/OPINIONS EXPRESSED ABOUT YELLOWSTONE NATIONAL PARK

Comments:

307 The natural beauty ...[is a] valuable asset for the state and nationally as they are so close to Yellowstone. **(Also comment letter 431)**

455 The area is an important buffer zone for Yellowstone National Park and the Wilderness areas... **(Also comment letters 487, 503, 431, 323, 340, 356, 442)**

319 ...the withdrawal...would reflect the will of the majority of people in the states surrounding the Park and across the country, and would be in the public's best interests to protect this unique ecosystem. **(Also comment letters 335, 481)**

362 Mining in this area is a threat to Yellowstone National Park and should not take place so near the park's boundaries. (**Also comment letters 348, 436, 321, 355, 482, 367, 380, 340, 431**)

496 I am also very disgusted with the U.N. attempting to dictate to us with what we can do and not do in our country. They have no business in Yellowstone.

371 The greatest value of the Greater Yellowstone Ecosystem is as a Biological Reserve large enough and ecologically intact enough that it will support a full compliment of all native flora and fauna. This certainly includes viable, self sustaining populations of the large predators such as gray wolves, grizzly bears, cougars, lynx and wolverines.

500 Yellowstone National Park, p. 84: Implementation of Alternative B-2 will also be a step in the right direction to start addressing the concerns that led to Yellowstone's designation by the World Heritage Committee as a World Heritage site in Danger.

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

WILDERNESS

Comment:

439 page 89, Wilderness, Introduction——The DEIS should have stated that the proposed withdrawal area is bordered on the east, north, and west by the Absaroka-Beartooth (A-B) Wilderness and on the east by recommended wilderness in Yellowstone National Park, which is managed as wilderness.

Agencies' Response:

The following sentence has been added in the "Introduction" of the "Wilderness" portion of Chapter 3:

With the exception of the highway corridor, lands within Yellowstone National Park west of the study area are recommended for, and managed as, wilderness.

Comment:

508 The effects of mining on water quality in the surrounding wilderness areas needs to be magnified. The potential for disaster should not be avoided to be mentioned in detail.

Agencies' Response:

This issue has been analyzed in detail, and the effects of mining on water quality, including on water entering designated Wilderness areas, has been disclosed in Chapter 3 under "Surface and Ground Water, Wetlands and Floodplains," subheading, "Surface Water Quality."

Comment:

439 page 91, Wilderness, Effects of Alternative A-1, 2nd column, 3rd paragraph——Rather than "short term" the DEIS should have specified the number of years the mine is expected to be active and the numbers of years involved in the reclamation phase.

Agencies' Response:

The following clarification has been added to this section:

"For the NWP, the anticipated period of operation (including reclamation) ranges from about 15-25 years depending upon the market for minerals. Additional mines could extend the period of mine activity."

GENERAL COMMENTS/OPINIONS EXPRESSED ABOUT WILDERNESS

443 We join millions of other American tourists who want to continue to enjoy our wilderness and thriving (living) wildlife on our public lands.

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

INVENTORIED ROADLESS AREAS

Comment:

439 pages 70-74, Effects of Alternative A——The effects on roadless areas are described for Alternative B-1 (page 74, 2nd paragraph). For continuity of comparisons among scenarios, the effects of roadless areas should also have been described for Alternatives A-1 and A-2. Designated roadless areas are not the equivalent of semi-primitive settings referred to at various places in the text.

Agencies' Response:

Effects to roadless areas are discussed in detail in the Final EIS, Chapter 3 under "Inventoried Roadless Areas."

Comment:

439 page 93, Inventoried Roadless Areas, Affected Environment, Beartooth Roadless Area, 1st paragraph——The DEIS should have specified the acreage for the 9 patented or private mining claims and the acreage for the 4 unpatented mining claims in the area.

page 95, Inventoried Roadless Areas, Affected Environment, North Absaroka Roadless Area, 1st paragraph——The DEIS should have specified the acreage in the 2 patented and in the 20 unpatented mining claims in the area.

page 95, Inventoried Roadless Areas, Affected Environment, Republic Mountain Roadless Area, 2nd paragraph——The DEIS should have specified the acreage included in the 5 patented and in the 2 unpatented mining claims.

Agencies' Response:

The number of patented and unpatented mining claims within roadless areas is approximate. The exact number and acreage is difficult to calculate due to the variable size of the claims and the precision of our maps in terms of the exact roadless area boundary. Furthermore, the information is not deemed critical for this policy-level analysis and decision on a mineral withdrawal.

Comment:

439 page 93, Inventoried Roadless Areas, Affected Environment, Beartooth Roadless Area, 3rd paragraph——The DEIS should have mentioned whether the roadless area is open or closed to off-trail and off-road motorized use. This also applies to the other 3 roadless areas.

Agencies' Response:

The travel management direction for roadless areas will be included in affected environment descriptions for each roadless area. In summary, off-road/trail vehicle travel, with the exception of snowmobiles, is not permitted within the Beartooth and North Absaroka Roadless Areas within the study area. There are no travel management restrictions for off-road/trail vehicle use for the Republic Mountain and Reef roadless areas.

Comment:

508 There should be a greater emphasis placed on the negative effects that mining would have on the surrounding roadless areas. The value of these areas should not be lessened because of their proximity to US 212 or other development.

Agencies' Response:

Since this comment provided no specific examples of where additional emphasis is needed, the text was not revised. The effects on roadless areas would vary greatly depending upon the location and size of future mineral activity.

Comment:

439 page 96, Inventoried Roadless Areas, Environmental Effects, Alternative A-1, 4th paragraph on page 96——Rather than "short term" the DEIS should have specified the number of years the mine is expected to be active and the number of years involved in the reclamation phase.

Agencies' Response:

The following clarification has been added to this section:

"For the NWP, the anticipated period of operation (including reclamation) ranges from about 15-25 years depending upon the market for minerals. Additional mines could extend the period of mine activity."

Comment:

439 page 97, Inventoried Roadless Areas, Environmental Effects, Alternative B-1, 2nd paragraph——Here the DEIS specifically states that the NWP would have an affect under Alternative B-1. This same emphasis should have been stated for other environmental effects under Alternatives A-1 and B-1 where the NWP agreement is not implemented and it is assumed that the New World Mine would be developed.

Agencies' Response:

The anticipated effects of the NWP were used as examples of the potential effects of mining, where appropriate. For example, the effects from the NWP served as an example of how mineral development could affect the manageability of roadless areas (Scenario A-1). While additional examples could be incorporated into this section, the potential effects of mining on roadless areas is adequately described.

Comment:

439 page 97, Inventoried Roadless Areas, Environmental Effects: Alternative B-2, last paragraph in this subsection——The DEIS mentions that motorized recreation would continue to increase. The DEIS should have more explicitly indicated the extent that current motorized use is on and off roads and trails.

Agencies' Response:

The following text has been added to this section:

"Motorized use, with the exception of snowmobiles, is confined to designated routes in the Beartooth and North Absaroka roadless areas. Therefore, the effects of increased use are confined to motorized corridors outside the winter season. Little off-road/trail motorized use occurs in the Reef and Republic roadless areas due to the nature of the topography."

WILD AND SCENIC RIVERS

Comment:

508 The fact that the Clarks Fork is a designated Wild river downstream of the mining withdrawal should be an extremely important item. The potential negative consequences downstream of pollution problems due to mining needs to be clear, as this is a prime motivator driving the withdrawal proposal.

Agencies' Response:

The following sentence has been added to the description of the Designated Wild River:
"Headwaters within the study area that contribute to the Clarks Fork include Fisher Creek and portions of Lady of the Lake Creek and the Broadwater River."

The potential effects on the Clarks Fork are described under Scenario A-1 in this section.

Comment:

485 Wild and Scenic River Potential. Referring to Table 9, it would follow that Alternative A would permit a situation potentially resulting in the Clarks Fork (an additional reach), Soda Butte, and Stillwater Rivers from no longer being eligible for inclusion in the National Wild and Scenic Rivers System.

Agencies' Response:

Under Scenario A-1, "Stillwater River," the EIS describes how mining could affect the outstandingly remarkable values and primitive character of the shoreline for the eligible segment. This is less likely to happen to the eligible portion of the Clarks Fork within the study area due to low mineral potential. If mine development significantly alters the characteristics or outstandingly remarkable values, the eligibility would be in question.

The effects analysis for Scenario A-1 indicates that mine development could affect water quality in Fisher, Miller, and Soda Butte Creeks. Mine development would not likely affect the eligibility (from a water quality perspective) of Soda Butte Creek, or the Upper Clarks Fork or Stillwater Rivers for inclusion in the Wild and Scenic River System.

Comment:

500 Wild and Scenic Rivers, page 98-103: Only the potential effects of the development of the various alternatives associated with the New World Mine itself have been analyzed. The author did not appear to have considered the other potential impacts in the area - i.e. possible open pit mines, underground mines other than the New World Mine, exploration activities, and most importantly, cumulative effects.

It would seem reasonable that the possible development of a number of mines in this area could have a significant effect on the values associated with Wild and Scenic River.

Agencies' Response:

The NWP served as an example of potential effects of mining, because there was a specific proposal with site-specific effects. Any other mine is highly speculative at this point. Therefore, the effects analysis remains at the generic level except where the NWP serves as an appropriate example.

The following paragraph has been added to the effects discussion under, "Wild and Scenic Rivers," Scenario A-1:
"The potential effects of future mining on designated and eligible Wild and Scenic River segments depends upon the location, size and operational success of future mines. If future mines affect the outstandingly remarkable values (scenic, recreational, geologic, fish and wild-

life, historical, and cultural) or the characteristics (free of impoundments, inaccessible except by trail, essentially primitive shorelines, unpolluted waters) of eligible Wild and Scenic Rivers, the rivers may no longer be eligible for designation."

Comment:

500 Map 3-10, page 99: The name of the Stillwater River is not listed properly. Only the word "River" was transcribed to the Map. Since this river is discussed in the text of this section, it should be listed on the Map for those who are not familiar with its location.

Agencies' Response:

You are correct. This map has been corrected to show ""Stillwater River".

LAND USE

GEOLOGICAL RESOURCES

Comment:

439 page 108, Geological Resources, Economic Geology, Recent Activity, 2nd column, last paragraph—The DEIS states that portions of 7 lode claims in the Goose Lake area extend into the study areas, but later in this paragraph the DEIS states that these claims are within the A-B Wilderness area, which is outside the study area.

Agencies' Response:

The paragraph referred to in this comment has been rewritten for clarification. None of the Goose Lake area unpatented claims extend into the proposed withdrawal area.

Comment:

439 page 110, Other Minerals, Oil and Gas—The DEIS should have stated the extent that the study area is or is not open to oil and gas leasing, exploration, and development.

Agencies' Response:

Chapter 1 of the Final EIS states that future decisions for oil and gas activities are beyond the scope of this analysis. The commentor is referred to the Beartooth Oil and Gas Leasing Record of Decision (1996), and the Custer and Gallatin Forest Plans for guidance regarding management of oil and gas resources on these two National Forests.

Comments:

450 Unless a compelling, public, national need is shown for a particular mineral, exploitation of public land for private profit is un-justifiable and based on greed, at the expense of the public and our future generations.

408 Gold is unnecessary because most of the mined gold today goes for jewelry to the drug lords and such adornment is unnecessary.

394 Mineral production is important to many of our basic and developing industries. Our country's space exploration, developing telecommunication system, and advances in medical technology are dependent upon the production of minerals.

497 Our America can document the nation's need for the copper during World War II from the McLaren Mine in the New World Mining District, and for the tungsten, molybdenum, and copper from the Jardine Mine.

317 Most of the manufacturing which is done in the United States is dependent upon mineral components. Preventing the extracting of such needed products hurts Montana's economy, decreases jobs, and makes our country dependent upon other countries for mineral resources.

437 Recovery of minerals is an essential part of America's economy and National well-being. Such recovery has been occurring on and under government lands for close to 100 years. With today's technology and common-sense regulatory safeguards to protect other resource values and to provide reclamation, mining is not destructive of other long-range resource management and the environment.

433 Our Country can not afford to purchase all metals and oil from Foreign Countries. We need many metals in our life style of today. Gold fore instance is needed for dental work, as well as many of the items manufactured today.

433 It is of great concern to me as a citizen who needs gold for my dental work to hear that people would like to stop all gold mining in United States. I am allergic to many metals other than gold and thus it becomes a medical problem as well as very costly to the elderly.

303 You have not considered the economic benefits mining jobs and related services could be for the people nor the need for the minerals for industrial use. Gold and other metals are for more then "babbles" as the Yellowstone Coalition and other groups claim.

Agencies' Response:

The Forest Service and Bureau of Land Management are guided, in part, by the Mining and Mineral Policy Act of 1970 (see Final EIS, Appendix B, page B-1). The demand for gold (and other minerals), and the purposes for which it is used, are summarized in Chapter 3 under "Land Use," "Geological Resources," and are more fully explored in Appendix B, "Locatable Mineral Resources Forecast for Future Mineral Activity," of the Final EIS.

Comments:

485 Last and perhaps most important are the wide range of impacts associated with the very uncertain prospect for reclaiming disturbed areas and disrupted natural processes as a consequence of mining related activities. This very low probability for successful reclamation (defined in terms of soil stability, re-establishment of native plant communities and restoration of natural drainage patterns and aquatic systems) means that mining and related development activities in the study area under Alternative A would leave permanent impairment of the soils, water, visual and associated biological resources. This impairment would constitute and irretrievable commitment (loss) of those resource values and numerous other dependent resource values such as fish, wildlife, scenic vistas, etc. .

317 Mining activities can be conducted, today, in a manner which eliminates many of the problems of the past and reclaims the land. We have many examples of projects conducted by our members which have actually improved wildlife habitat and restored the land.

Agencies' Response:

On-site, long-term research indicates that reclamation of high elevation, harsh environments is possible; although, it is expensive and relatively slow due to a short growing season.

Comment:

497 If the NWM agreement is **not** implemented, a withdrawal in that area would severely limit the United States Forest Service's options to consider various locations for tailings facilities.

Agencies' Response:

This is disclosed in Chapter 2 in the Table displaying the "Comparative Summary of Effects," under "Land Use," Alternative B, Scenario B-1. This is also addressed in Chapter 3, "Land Use," under "Private Lands and Unpatented Mining Claims."

Comment:

450 I believe Alternatives A-1 and -2 underestimate the potential for mining activity, as any of the potential sites on public land can be developed even on a limited (e.g., hobby) basis and cause disruption of natural features.

Agencies' Response:

Mining activities projected under Alternative A-1 and A-2 Scenarios are based on past and present activity, as well as many other factors. (See Appendix B, page B-1, "Scope," of the Final EIS.)

Comment:

439 page 116, Geological Resources, Effects of Alternative B-2, 1st paragraph——The statement that the withdrawal and implementation of the NWM Agreement would adversely affect short and long-term potential mineral production in the study area, etc., is misleading. The withdrawals would have short term (20 years) adverse impacts and may have long term (>20 years) impacts, and changes in mineral economics may or may not (rather that just may not allow for development if the withdrawal is revoked after 20 years. With inevitable improvements in mining technology, increasing population in the USA and world-wide, and increasing standards of living and demands on mineral resources, it is much more likely that mineral economics 20 years in the future will allow, rather not allow development of the resources.

Agencies' Response:

This section has been reworded to reflect these comments. The third and fourth sentences in this paragraph (in the Final EIS) now read, "This would adversely affect short-term and possible long-term potential mineral production in the study area. Changes in mineral economics may or may not allow for..."

Comment:

439 page 116, Geological Resources, Effects of Alternative B-2, 2nd paragraph—Shouldn't the DEIS have indicated that both Crown Butte's patented

407

as well as unpatented land would be acquired by the federal government and would be unavailable for mining? The specific acreages of private and unpatented mining claims covered by the agreement should have been cited here.

Agencies' Response:

For clarity, the third sentence in this paragraph has been changed to indicate that Crown Butte's patented and unpatented land would be acquired by the federal government and unavailable for mining.

GENERAL COMMENTS/OPINIONS EXPRESSED ABOUT GEOLOGICAL RESOURCES

Comments:

317 It is our hope that other measures to mitigate any perceived problems will be considered for this area and this unrealistic proposal will be withdrawn.

423 The proposed withdrawal area is in a highly prospective geologic setting where significant new mineral deposits may be found and developed.

457 Minerals can only be mined where they exist. This mine site is one of the higher grade ore bodies in North America for gold, copper and silver. The area has been mined since 1869 and quite heavily in the 1930s to the 1950s.

499 The significant mineral potential of the proposed withdrawal area has been known for many years, and the area has produced minerals with no significant adverse affect to other multiple users or to the integrity of Yellowstone National Park.

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

PRIVATE LANDS AND UNPATENTED MINING CLAIMS

Comment:

439 page 116, Private Lands and Unpatented Mining Claims, Affected Environment——The DEIS refers to 794 acres that were patented for non-mining purposes. These purposes should have been specified. How can USFS land be patented for non-mining purposes? Clarify. the DEIS should have described the kinds of activities and development, other than for mineral development, that can take place on patented land in the study area and whether county, state, or federal regulations and constraints apply to these activities and developments. Such discussion is essential to fully understand the potential environmental effects that could occur on these patented lands.

Agencies' Response:

The 794 acres of private land were patented under the Cash Entry and Homestead Entry Acts.

As mentioned in the Introduction to the "Land Use" section of Chapter 3, Park County land use regulations do not include any zoning for the Cooke City/Silver Gate area. Local citizens and the Park County Planning office are exploring zoning options for the area. Currently there are few restrictions on how private land can be developed in this area. If lands are subdivided, the subdivision is subject to a review and approval by the county commissioners. If a septic system is installed, a permit from the county sanitarian is required. The federal government has no jurisdiction concerning development of private land.

Comment:

506 The DEIS is deficient in that it contains the insupportable conclusion that under Alternative B "mining would not be anticipated as a result of the proposed mineral withdrawal" (page 20, DEIS).

This only could be true in the event that the federal government has already decided that it will not allow mining on a.) other patented inholdings, or b.) valid unpatented mining claims within the study area. Further, it belies the statement that 'decisions regarding future mining on private land or unpatented mining claims are beyond the scope of this analysis' (page 6, DEIS). The policy used by the federal land management agencies in settling valid existing rights must be publicly disclosed in the final EIS.

Agencies' Response:

The purpose and limitations of the "Forecast for Future Mineral Activity" are described under the "Introduction" to Chapter 3. For purposes of this analysis, a hypothetical model was used to estimate future hardrock mining in the area. The forecast is speculative in nature

and is not meant to imply that listed activities would actually occur. The forecast serves as the basis for evaluating the potential effects of a withdrawal on mineral resources, and it serves as a basis for assessing the potential effects of mining-related actions on area resources.

Comments:

507 In determining a "Preferred alternative" in the DEIS process; What is more important, to "*...protect water quality and fresh water fishery resources within the watersheds of Soda Butte Creek, Clarks Fork River, and Stillwater River...*" by keeping "environmentally preferable" mining options open on Federal land, or to implement a mineral withdrawal which, according to table 2-3, scenario B-1; will "...increase the risk to water quality and wetlands" and scenario B-1 on page 119 states: "The lack of available federal land could result in environmentally less preferable development on private land"?

How will the CCAMW, scenario B-2 achieve the stated purpose of the withdrawal: "*to protect water quality and fresh water fishery resources within the watersheds of Soda Butte Creek, Clarks Fork River, and Stillwater River from the effects of future hardrock mining activities that could occur on federal lands in the headwaters of these streams.*" When table 2-3 states; B-1 will "...increase the risk to water quality and wetlands" compared to A-1 and scenario B-1 on page 119 states: "The lack of available federal land could result in environmentally less preferable development on private land"?

Will the goal of protecting "*...water quality and fresh water fishery resources...*" be fully attainable with the CCAMW, or will the CCAMW only provide partial protection, while creating new problems such as "Lack of federal lands for mining related facilities could result in less environmentally preferred development on private land, depending on the size and location of a future mineral a[illegible]."? *(CCAMW DEIS, pg. 179)*

The Draft EIS identifies the implementation of the NWM Agreement as critical to the successful implementation and achievement of the stated purpose and goals of the CCAMW. For without the "Agreement" mining can and will take place on private land within the CCAMW. The CCAMW, DEIS identifies scenarios A-1; No withdrawal and no NWM agreement and B-1; a Full withdrawal and no NWM agreement as virtually identical. Mining will occur.

Table 2-3 of the Draft EIS actually identifies scenario B-1; A full withdrawal and no NWM agreement as having MORE negative implications than scenario A-1; No withdrawal and no NWM agreement and actually INCREASING the probability for environmental damage by eliminating environmentally preferable mining options.

505 ... if the withdrawal is approved but the New World Agreement is not implemented, it is likely that the withdrawal will result in greater environmental impacts than would have occurred if the federal lands had not been withdrawn. The proposed withdrawal makes no environmental sense, and in the face of the present record, a decision to proceed with the withdrawal would be arbitrary and capricious.

505 To the contrary, the DEIS provides significant evidence that the withdrawal could actually cause more adverse environmental impacts if the New World Agreement is not implemented. See DEIS at Table 2-3 (Comparative Summary of Impacts). In evaluating the potential impacts of Scenario B-1, the DEIS repeatedly states that Scenario B-1 "would reduce the availability of adjacent federal land for NWP facility sites, and require facility development on private land and on existing unpatented mining claims. This could result in more environmentally impactive locations for some of the NWP facilities and increase the risk of adverse impacts . . . compared to Scenario A-1." DEIS at 44,46, 62, 102, 119.

Agencies' Response:

For Scenario B-1, the EIS states that lack of available federal land for facilities "could" result in environmentally less preferable development on private land. (Chapter 3, "Land Use," "Private Land and Unpatented Mining Claims") Unless a site-specific proposal is available to evaluate it is difficult to draw conclusions about whether or not the potential development on private land would be "environmentally less preferable."

Comments:

505 ...the DEIS understates the impacts on the valid existing rights of present claimants. The DEIS states that a withdrawal "would not affect a claimant's right to hold and maintain valid, existing unpatented mining claims within the withdrawal area." That statement is literally true; a

claimant could continue to hold those rights. However, the withdrawal would demonstrate the federal government's commitment to block any mineral development in the New World District, and those claims would be, for all practical purposes, meaningless. The DEIS fails to adequately analyze these indirect impacts on valid existing rights.

506 The implied assertion that retaining the ability to hold or sell a valid existing claim is the sole test of whether a valid existing right is being honored is without legal foundation. If a property can not be developed, it is worthless. The Supreme Court has ruled that if the government renders a property worthless by preventing any reasonably expected development, then a taking has occurred. The actual intent of the federal government is demonstrated by its statement on page 119 of the DEIS, and by the presumption in Alternative B-2 that no mines will be developed in the future. Therefore, Executive Order 12630 requires a Takings Implications Assessment under these circumstances.

Alternatively, the absence of any mining under Alternative B-2 also suggests taking implications. Thus, this aspect must also be addressed in the DEIS. Takings is a standing issue arising out of the New World Agreement.

Such statements as, "mineral withdrawal does not prevent the sale of unpatented mining claims" and "development could proceed on...unpatented mining claims subject to the normal permitting process," offer little reassurance to those holding unpatented mining claims in the study area.

489 The withdrawal of federal lands other than those currently held by Crown Butte Mines will significantly impact the ability of other valid patented mining claim owners from developing what they may perceive as their potential resources. This will occur because other adjacent unpatented ground is usually required in order to develop these mining interest. It will not be possible for these other patented mining claim owners to use these adjacent federal lands, and will likely lead to what are valid "takings issues" and lawsuits for these patented mining claim owners.

488 If the withdrawal occurs, what does the withdrawal do to the value of the inholdings, how are the owners compensated for any decrease in such value, and which agency of the federal government is responsible for payment for such "takings"? If this withdrawal is approved the private claims outside of the Crown Butte holdings will be rendered useless because of the inability to use the joining land. **(Also comment letters 303, 396, 397, 478, 497)**

396 We were only recently made aware of the mineral withdrawal for Cooke City, which will directly impact the land we own there. This withdrawal substantially diminishes the value of our property, as stated in the draft EIS. We expect to be compensated for this loss and, if the Federal Government does not purchase our land, we will continue to oppose any withdrawal of mineral rights in the area.

453 A withdrawal would set a dangerous precedent for taking public and private lands away. **(Also comment letters 300, 459-466, 470, 492)**

376 I have patented claims within the study area. What effect will the withdrawal and/or the agreements have on my property and will these 2 processes indicate how the FS will manage these private inholdings.

314 This is public land and does not affect private land or unpatented mining claims in this area. **(comment letters 329, 338, 355, 420)**

Agencies' Response:

The Fifth Amendment of the Constitution prohibits the taking of private property without just compensation. The withdrawal does not apply to private land, nor does it affect rights associated with unpatented mining claims. The withdrawal is not a regulation that directly effects the use or value of private property. Ownership of private land does not convey any rights to use of adjacent federal lands.

The EIS states that the mineral withdrawal could affect future development of private land and unpatented mining claims. Any such effects are highly speculative and would depend upon site-specific development plans. There is no evidence that a mineral withdrawal would reduce property values in the area.

The Forest Service does not manage private inholdings. Therefore, the withdrawal does not constitute a takings.

Comment:

439 page 118, Private Lands and Unpatented Mining Claims, Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Agreement Implemented, 3rd paragraph—— The DEIS should have more forcefully pointed that without the withdrawal and without the actions mentioned in this paragraph, Crown Butte Mines, Inc. or other companies or individuals could restake claims in the area covered by the NWM Agreement—and they probably would considering the known mineral potential of the area.

Agencies' Response:

The following sentence has been added:

"Filing of mining claims on highly mineralized areas and on potential facility sites would be likely."

Comment:

439 page 119, Private Lands and Unpatented Mining Claims, Environmental Effects of Alternative B-2, 2nd paragraph, last sentence——This sentence should have more explicitly referred to private land and unpatented mining claims that would not be acquired through the NWM Agreement.

Agencies' Response:

The sentence has been modified in the Final EIS to include the following:

"...effects to private land and unpatented mining claims that would not be acquired under the NWM Agreement."

Comment:

396 My family owns approximately 120 acres in the proposed Cooke City Area Mineral Withdrawal (CCAMW) site. We have been attempting, through our Congressional delegations, to contact the appropriate parties to discuss the sale of our property.

The draft EIS (pg 182), for CCAMW, included a modification for an "Amendment to Proposed Withdrawal; Montana" which stated "The modification include withdrawal of any private land and minerals that might be acquired in the study area in the future, either as a result of the NWM Agreement or from other willing sellers." We are willing to sell this land to the Federal Government for the same price that was offered to Crown Butte Mines for their mining properties.

366 I am very concerned with the lack of information that my family has received concerning this project. We own approximately 120 acres in the proposed site boundaries and have had to deal with no communication, delays a[illegible] misinformation from the federal government.

Beginning in August, immediately after the President announced the agreement with Crown Butte Mines, my family began writing to our congressional delegations asking for information and points of contact for the proposed land swap.

On October 16, 1996, Mr. W. Hord Tipton, Assistant Director, Minerals, Realty, and Resource Protection, Department of the Interior, Bureau of Land Management, responded to an inquiry from Congressman Brian Bilbray(CA) on my behalf. In the last paragraph of his letter he stated "As to Mr. Counts; family entering into a similar exchange agreement, we have taken the liberty of forwarding his letter to the Forest Service as his mining property lies within the Forest Service boundary. As of today, March 30, 1997, I have not received any communication from the Forest Service.

I initiated a request ,under the "Freedom of [illegible]mation Act (FOIA), in my response to Mr. Tip[illegible]'s letter dated 11/29/96. On 12/20/96, I received another letter from the Bureau of Land Management stating that my FOIA request would be processed, with extensions taken, on or before February 6, 1997. I have yet to receive the FOIA information from the Bureau of Land Management.

Agencies' Response:

The NWM Agreement calls for Crown Butte Mines, Inc., to convey all of their interests which includes the surface and mineral estate. Although your properties are close to the land acquisitions being considered in the NWM Agreement between Crown Butte Mining Company, U.S. Government, and the Greater Yellowstone Coalition, they are not included within the text of the Agreement.

The Gallatin National Forest in Bozeman, Montana, may have an interest in acquiring your properties as part of their long-term land acquisition program. Therefore, your letter has been forwarded to that Forest. If they are interested, they will contact you or you may contact them regarding your desire to sell your land.

When we received your letter (April 3, 1997) we checked on the status of your FOIA request and

were told it was being processed. It is our understanding that this request has since been answered.

FOREST PLAN CONSISTENCY

Comment:

505 **The DEIS Does Not Comply With the Withdrawal Criteria In the Gallatin and Custer National Forests' Forest Plans.**

Both the Gallatin and Custer National Forests' Forest Plans include criteria for evaluating proposed mineral withdrawals. The DEIS fails to consider those criteria suggesting that they "are only applicable to smaller withdrawals such as those recommended as a means to protect campgrounds, picnic areas, and other administrative sites." The DEIS should have considered the Forest Plans' withdrawal criteria; evaluation under those criteria would have further underscored the inadequacies of the Department's withdrawal analysis.

Contrary to the statement in the EIS, the Forest Plans do not specify that the withdrawal criteria apply only to "smaller withdrawals." Indeed, the Gallatin National Forest Plan states, without *qualification*, that "future withdrawals from mineral entry will be evaluated based on the criteria contained in 43 CFR 2310 and Section III of Appendix D." Forest Plan at II-25. Among the outlined criteria, is the need to evaluate "alternative means of protecting the resource values of concern." Custer National Forest Plan at App. IV. The DEIS outlines the stringent regulatory requirements that would be imposed on new mining operations in the study area. Nonetheless, rather than considering whether—consistent with the Forest Plans' withdrawal criteria—the existing statutory and regulatory regimen are adequate to achieve the withdrawal's stated purpose, the DEIS glosses over the criteria, improperly discounting their applicability. The criteria outlined in the Forest Plans deserve careful consideration in the Final EIS; particularly where the Department proposes to withdraw lands that were considered in the planning process and assigned to a management area that provides for the exploration and development of mineral resources. See DEIS at 121.

Agencies' Response:

The statement in the DEIS that the evaluation criteria contained in Appendix D of the Gallatin Forest Plan are only applicable to smaller withdrawals is based on the context provided in the introductory paragraph of this section where it states:

"On the Gallatin National Forest certain specific areas have been withdrawn from mineral entry. These areas may be current administrative sites, land for expansion of current administrative sites, ski areas, campgrounds, picnic areas, lookouts, ranger stations, and some specific recreation areas such as mineral springs" (Gallatin Forest Plan, pg. D-3).

The Custer Forest Plan (Appendix IV) contains similar wording.

In addition, since the Forest Service does not have the authority to withdraw lands from mineral entry, the criteria provided in the Forest Plans would be applicable only to the extent of determining whether the agency should "initiate" or "request" a withdrawal action (Gallatin Forest Plan, pg. D-4 and Custer Forest Plan, pg. 165). Since the Cooke City Area Mineral Withdrawal was proposed by the Department of Interior at the request of the President, the "initiation" or "request" of withdrawal action becomes a moot point. The evaluation criteria contained in the Forest Plans is binding only on the Forest Service and is not applicable to withdrawal proposals initiated by the President and/or the Secretary of Interior.

In spite of the legal applicability, information is provided throughout the Cooke City Area Mineral Withdrawal EIS which addresses these criteria. For example, discussion of existing laws and regulations is included in Chapter 2. Chapter 3 identifies pertinent laws and regulations applicable to mining proposals which are designed to protect the environment. The resource values of the area and potential risks are described in the Affected Environment sections of Chapter 3. The mineral potential of the area is discussed under Land Use in Chapter 3 and in the Forecast for Future Mineral Activity in Appendix B. In summary, information relative to the Forest Plan criteria is presented throughout the EIS and will be considered in making a decision over proposed mineral withdrawal.

ECONOMICS

Comments:

301 The need to develop the Crown Butte deposit or other mines in the area that will reduce the U.S. Balance of Payments deficit by hundreds of millions of dollars per year. What other action will help meet the need for gold and silver, and reduce the United States trade deficit by the additional exportation of gold?

303 You have not considered the economic benefits mining jobs and related services could be for the people, nor the need for the minerals for industrial use.

435 Recovery of minerals is an essential part of America's economy and national well being. Such recovery has been occurring on and under government lands for close to 100 years."

Agencies' Response:

A description of geological resources including general geology, mineral demand, economic geology, historical activity, and recent activity is included in the Final EIS in Chapter 3 under "Land Use," "Geological Resources." The economic benefits of mining in terms of employment and income are described in the Final EIS in Chapter 3, "Economics" under the section on "Employment and Income." The effects on government finances are described in that Chapter under "Government Finances."

The disposition of the minerals from any potential mine in the affected area is difficult to determine, and calculating the effects on the balance of payments is outside the scope of the decision to be made based on this analysis. The effects to the balance of payments would have a negligible effect to the economic well-being of the citizens of the local two-county impact area.

Comment:

360 More could have been said in your draft about the possible 22.5 million for cleanup being spent here if the NWM agreement is implemented, offsetting any hoped for financial benefits by Park County. This 22.5 million will be realized over 5 years not over a period of 10 to 20 years mine life such as law enforcement, housing or environmental problems the NWM would have caused.

Agencies' Response:

The $22.5 million cleanup project is not part of the proposed action for the proposed mineral withdrawal. It is a related, but not connected action, that could have cumulative economic effects, along with many other related and unrelated potential activities. However, a rough estimate has been made in the Final EIS of the potential employment and income that will be generated by the potential cleanup project. The projections are limited, because there is not much information available.

Comment:

488 Your analysis of the economic issues related to the withdrawal does not focus sufficiently on the positive economic effects of mineral development. In the area of seasonal and, at best, low paying jobs, a mineral development would present significant improvements to the business economy and tax base of the area. A more thorough analysis must be made of the positive affect of mining on the local and regional economy. Such an analysis should specifically discuss the negative impacts on towns such as Cooke City, Montana and Cody, Wyoming if proposed mining operations are not undertaken.

Agencies' Response:

The Final EIS discusses the effects of mineral development at different intervals in terms of employment, income, economic resiliency, and government finances. This discussion can be found in the "Economics" section in Chapter 3.

The Final EIS contains a substantial amount of economic effects information about the major communities in Park County, Montana, and Park County, Wyoming. Such effects are described in terms of income, employment, and governmental costs and revenues.

Comment:

498 On page 125, in the Economics section, I would suggest replacing the "Mining" sector earnings with "Metal Mining" which is separately identified by the Bureau of Economic Analysis. As is referred to in the text on that page, "Mining" includes among other things, oil and gas development which can be misleading, especially for Park County, Wyoming. I would also refer the Team to an economic review of the mining industry by Dr. Thomas Power and the University of Montana entitled *Not all That Glitters*.

413

Response:

In the Final EIS, the discussion in the section referred to above shows that metal mining and oil and gas development are separate activities under the mining economic sector. Also the mining economic sector was intended to include all mining, including metals mining, as well as oil and gas. (See Table 3-10 in Chapter 3 of the Final EIS.)

Comment:

506 The ripple effect from the situation surrounding this particular withdrawal is having a chilling effect on domestic investment for new mineral production. It is reinforcing the image of the federal government as being committed to thwarting any mine proposed on public lands in the United States. The economic analysis of the DEIS should include this aspect as the impact to the national economy from the current policy direction by Interior is profound. Based on our review of industry publications, we estimate that a minimum of $500 million of investment capital has been redirected to foreign ventures over the past several years. The effected area obviously extends well beyond Cooke City and environs.

Agencies' Response:

The purpose and need does not include the intent to establish national policy on mining on Federal lands. There is no conclusive evidence that the proposed action is responsible for redirection of investment capital to foreign countries. However, it is rational to assume that if mining becomes more expensive or unavailable on Federal land the rate of return on mining investments on non-Federal land becomes more attractive and the capital will follow. Attributing the flow of $500 million dollars to foreign ventures to decreasing mining opportunities on Federal may not be accurate. There are many other variables that could encourage investment in foreign ventures. The role that this withdrawal plays in the overall investment picture is obscure.

The economic consequences of not mining in the Cooke City/Silver Gate area are discussed in the Chapter 3, "Economics," of the Final EIS. A statement has been included in the Final EIS to recognize the above concern.

Comment:

506 The section on economics fails to provide a reasonably thorough discussion of several significant aspects, largely due to insufficient depth or lack of detail. While it is claimed that much of the discussion is derived or built upon a technical background report (page 124, DEIS), the report is not provided as an appendix. Unfortunately, the DEIS discussion does not stand on its own, thus preventing the public from properly determining what the impacts will actually be to communities in the area. In addition, several sections also reach conclusions that are unsupported due to questionable assumptions and inadequate evaluations. The end result is that the 'effect' conclusions reached in the economic and social sections are not entirely valid.

Agencies' Response:

The technical background report is not included as an appendix because it, in itself, is as large as the Final EIS. However, it is included in the project file and is available for public review upon request.

Comment:

506 The industry profile asserts that mining comprised only 4% of the earned income of the economy of Park County, Montana (page 124, DEIS). However, this figure could be easily be low by a factor of 2. In economic studies conducted by the University of Idaho on mining employment in Lemhi County, Idaho several years ago, the initial report reached a similar conclusion. It is instructive to note that this conclusion proved incorrect due to artifacts of how labor statistics are reported. For example, drilling contractors and geologists are normally considered to be part of the 'service industry' rather than miners. The same is true of support staff. The result was when all mining industry jobs were counted the direct economic impact doubled.

Agencies' Response:

The above comment is basically true. However, many other economic sectors have the same structural composition where employment and income attributable to those industries is accounted for in other economic sectors. The "indirect effects" of mining on local employment and income are calculated and disclosed in Chapter 3 of the Final EIS, under the section titled, "Economics," "Employment and Income." This includes employment and income generated in the sectors discussed in the above comment.

EMPLOYMENT AND INCOME

Comment:

494 The Cooke City area offers few job opportunities. Mining activities provide good jobs. The average miner in this country makes over $43,000 a year and has good benefits. A mining job would pay more than twice, almost three times the annual salary Park County, Montana and Park County, Wyoming workers currently receive. Many Montana and Wyoming residents would benefit from jobs if this area is allowed to produce minerals.

Many more small and large companies will provide products and services to the company or companies that mine this area. We believe a mining project has an economic multiplier of about four. Meaning that for every million dollars the mine pays in salaries or for supplies ... grows to four million dollars as it is spent by those who earn the money.

Agencies' Response:

The amount of employment and income generated by mining activities and the indirect effects of mining activities on employment and income is thoroughly discussed in the "Economics" section of Chapter 3 in the Final EIS. An analysis done subsequent to the publication of the Draft EIS, using an economic input-output model indicated that the multiplier could be as high as 2.58, but is probably in the area of 2.0. This new information was used to estimate a new upper limit on economic effects for the Final EIS. The methodology used has been documented in the Cooke City Area Mineral Withdrawal project file.

Comment:

301 The need to provide good paying jobs in Montana. The proposed Crown Butte miner and other mine developments will provide employment opportunities to Montanas at an average salary of $36,000. What action of withdrawal will replace these potential jobs?

Agencies' Response:

The above information about employment and income is included in the Final EIS. The economic consequences of the withdrawal are explained in the Final EIS in Alternative B Scenarios B-1 and B-2, as follows:

"The economy would continue to grow as a result of predicted growth in the tourism industry." The withdrawal does not propose to replace jobs that might have happened had mining occurred (see mining probabilities, Appendix B, Table B-2)".

Comments:

317 Most of the manufacturing which is done in the United States is dependent upon mineral components. Preventing the extracting of such needed products hurts Montana's economy, decreases jobs, and makes our country dependent upon other countries for mineral resources. Curtailing mining production also has significant impacts on local school districts and county tax basis. **(Also comment letter 333)**

Agencies' Response:

The economic importance and characteristics of the minerals in the impact area are described in Chapter 3, "Geological Resources," and in Appendix B, "Locatable Mineral Resources, Forecast for Future Mineral Development" of the Final EIS.

The effects of the proposed action and its alternatives on government finances, including the effects of financing local school systems, are discussed in Chapter 3, "Economics," "Government Finances," " Environmental Effects" of the Final EIS.

Comments:

435 In addition, this [withdrawal] would deny good high paying job opportunities for workers and their families... **(Also comment letters 373, 422)**

453 Industry which creates wealth should be retained in the area. It pays most of the county taxes and pays one of the highest wages." **(Also comment letters 459-460, 470, 492)**

457 This could be a major boost to the economy of the Cooke City area and other towns in Montana and Wyoming. Mining pays some of the highest wages of all industry. The jobs provided by this mine create opportunities for services and suppliers throughout an extensive area.

363 Mining provides good paying jobs, increases our tax base, and adds to our economy. This particular area is already devoid of good paying jobs. Most work is seasonal.

307 Although this portion of the Northern Rocky Mountains does not offer very many high-paying

jobs, a value on the Cooke City Area should be considered as either a long-term protection, or as a short-term financial windfall.

Agencies' Response:

The Final EIS fully discloses the potential income and employment generated by mining activities in Chapter 3 under "Economics," "Employment and Income." The text in this section states the following.

"Average income per new mine worker would be about $37,000 per year. These wages would be consistent with existing mining and construction wages in the area. Mining would be among the highest paying jobs in the two-county area."

This section addresses employment with the mining companies, powerline construction, road reconstruction, maintenance and snow removal, and construction of workers' quarters in the mining areas. It also includes indirect employment and income from spending of the wages earned in the activities just mentioned. This includes additional jobs in the service, retail, transportation, public utilities, and government sectors.

Comment:

304 What is not stated, in the summary, is the temporary nature of mining. Granted jobs in the mining industry pay more than those associated with tourism but the jobs derived from mining are temporary. Sooner or later mining, of an area, is completed. The highest paying positions do not go to the local people but to the company's people. These people are brought in from mining areas being shut down. They require homes, schools, etc. When they finish mining the area, and they will, the local economy will be devastated.

Agencies' Response:

Although the "Summary" document does not include an explanation of the effects of mining shutdown, these effects are addressed in Chapter 3 of the Final EIS under the "Economics" and "Social" sections. For example, under "Economics," "Employment and Income, Environmental Effects," it states,

"Once potential projects close, income and personal spending would decline to what it would have been without the project. Service industries would adjust to the reduced levels of spending by scaling back employment and output. The project would constitute a relatively small proportion of income in all residency areas except Cooke City/Silver Gate, Montana, and the adjustment to loss of project income would be most severe in Cooke City/Silver Gate unless the project proponent and county planning mechanisms provide plans for smooth transition."

Comment:

305 In the short term development of mining infrastructure will create a limited number of local jobs and utilize some local contractors. Almost all large infrastructure items will be fabricated elsewhere and be tracked to the mine sites for assembly.

In the mid term a small number of well paying mining jobs will be created as modern mining is not a labor intensive industry. At the same time a larger number of lower payed jobs will be lost in recreationally related industries.

In the long term the mines will close, the tailing impounds will exist, the streams will be silted up, the acid-rock drainage will have contaminated the ground water and the areas scenic value will have declined along with its wildlife, aquatic and plant communities. Finally there would be few recreational jobs and no mining jobs remaining.

381 ...the revenue assumptions for local government under a mining scenario appear to be based on the most optimistic of assumptions rather than more likely ones. ...the analysis ignores the fact that, while the revenue is foregone, so are the multitude of costs.

384 The benefits to people, employment, taxes, etc., far outweighs the small negatives associated with mineral exploration and mining activity in this area.

450 The short-term (1-20 years) benefit if additional jobs and income in the area is more than offset by the cost of supplying new housing, electrical services, etc., that current residents will share the cost of during and following the mining era.

Agencies' Response:

The economic and social effects of mining are discussed in Chapter 3 of the Final EIS in the "Economics" and "Social" sections. These sections include discussions of the effects on eco-

nomic structure, employment, income, government financing, housing and the quality of life. All of the variables discussed in this comment were factored into the analysis determining the effects disclosed in the Final EIS.

Comment:

392 The DEIS says the economy is dependent on tourism and non-earned income. Non-earned income would be either people on welfare or rich people. This would indicate Montana wage earners are being forced out of the area. Does this mean that the purpose of this withdrawal is to set this land aside as a playground for the rich or a preserve for the poor?

Agencies' Response:

The Final EIS states that the study area's economy is strongly influenced by four factors. One of these factors is that a large share of non-earned income (rather than wages) as a source of resident income. Non-earned income consists largely of social security and retirement annuities. This fact, along with the analysis of per capita income for the area does not suggest that the area has been "set aside as a playground for the rich or a preserve for the poor". The purpose of the withdrawal is clearly stated in Chapter 1 of the Final EIS. The purpose includes the protection of recreation opportunities from the potential effects of mining activities if federal lands are not withdrawn from mineral entry. However, much of the recreation activity is by people from outside the Cooke City/Silver Gate area.

ECONOMIC RESILIENCY

Comment:

304 During the operation of the mines, tourism, which fuels the greatest percent of the local economy would be greatly diminished. Who would want to share the newly completed Wyoming Highway 296 with ore carrying trucks?

Agencies' Response:

The document states "conflicts between large truck traffic and recreational traffic are likely on US 212 and Wyoming 296, and on other area roads such as Miller Creek or Lulu Pass Road should future mines be developed. Increased traffic on area highways and mine-area roads may make recreational traveling and viewing less acceptable and more dangerous for some persons, depending on individual or group values and expectations. An increased use by trucks for hauling tailings off-site would be noticeable and considered by many recreationists to be incompatible with the highways designations as scenic routes".

Comment:

506 The discussion on economic resiliency and its relationship to dependency (page 129, DEIS) makes the unsupported claim 'that its [recreation and tourism relative size is causing the economy to lose resiliency has no scientific support.' This statement is in direct conflict with the facts presented from the Corkran survey which indicated that tourists and outdoor recreationists account for a total of 70% of the total business revenue in Park County, Montana (page 125, DEIS). Despite apparent assertions to the contrary in the meaningless discussion on economic diversity (page 129, DEIS), it is quite clear that the local community has little to fall back on when the time inevitably comes for a down turn in tourism. It is well documented that tourist/recreation dependent communities periodically suffer economic hardship whenever there is a recession or other event that discourages discretionary domestic travel.

Agencies' Response:

The reference to the Corkran Survey states that seventy percent (70%) of total business revenue in the Cooke City/Silver Gate area is attributable to tourism and outdoor recreationists. The above comment refers to Park County, Montana, which is far less dependent on the recreation tourism industry. Also, when determining dependency on a particular industry the amount of total revenue is not a good indicator. A better indicator is employment, total income, or wage income. That is why total business revenue was not used as a unit of measure in disclosing the economic effects of mining.

Comments:

353 The natural beauty and productivity of the riversheds that begin high in the Absaroka-Beartooths are self-renewing resources that provide jobs and incomes in perpetuity. These values should not be compromised for a flurry of short-lived jobs and income.

321 The economic impacts of the proposed New World Mine on Cooke City, the Beartooth Wilderness and the north east Yellowstone Park from the mines employees etc. will forever change the pristine qualities.

393 Any commercial activity to harvest the area's natural resources is certainly a detriment to the tourism based economy.

421 All indications are that this recreation use will increase and that it will be sustainable, provided that the region is not drastically impacted by such things as major mining operations.

437 I view the future of this state as profoundly based on tourism/recreation which future mining activity - a short-sighted, minimal benefit industry - would severely impact; the monetary losses eclipsing any income it might provide even as a short term activity.

438 The present tourist economy would be severely affected and mining has always been short-term which usually ends up being economically disastrous.

471 Cooke City's location at the termini of two scenic highways, between two mountain wilderness areas, and adjacent to Yellowstone Park make it an ideal location for a recreation based industry. It has made significant steps in that direction and has made the area totally unsuitable for mineral development.

477 As business owners, we are aware that our tourist/recreational based business would be detrimentally affected.

486 As twenty year owners and operators of the Cooke City Store we can attest to the economic necessity of preserving the scenic, esthetic, wildlife, and recreation values that form the lifeblood of our sustainable tourism industry. The mineral withdrawal would provide a very positive impact to our local tourism and recreation economy."

Agencies' Response:

The importance of the effects of recreation and tourism on the economies of Park County, Montana, and Park County, Wyoming, are discussed in Chapter 3 of the Final EIS under "Economics," in the section titled, "Economic Resiliency." In this section, under the discussion of effects of Alternative B-2 (Mineral Withdrawal Implemented - NWM Agreement Implemented), the discussion states "the economy would continue to grow as a result of predicted growth in the tourism industry".

Comment:

485 It is a generally accepted fact that mining based economies follow a boom-bust trend; with the local residents that remain in the are following the boom having to bear much of the burden for public infrastructure and social consequences. There is evidence of this all around Montana and the West. By contrast, economies based on recreation and tourism have experienced steady long-term growth. This fact would strongly favor Alternative B; particularly in view of the year around recreation/tourism potential of the area.

Agencies' Response:

The effects of reductions in mining operations on the local economy are discussed in Chapter 3 of the Final EIS under the section on "Economics," "Employment and Income." The possibility of temporary shutdowns is acknowledged and the effects are discussed.

GOVERNMENT FINANCES

Comments:

392 It should also be noted that the state, county and local infrastructure would benefit from mine taxes directly, and indirectly from taxes paid by suppliers that make their living dealing with mines.

390 We are paying a huge property tax which would be worse without the tax income from mining. The local ranchers and farmers are having a hard time hanging on as it is.

403 As for taxes for schools. Those extra miners children that come to mine would not need to have schools provided if the extra burden was not placed on the counties by mines bringing in transient and temporary workers.

422 This state and other west and northwest states were founded and dependent on mining, logging, lumber, cattle, and all round ranching; without these this will become a "welfare" area. The state does not get taxes from Federal lands to provide proper schooling for children and other services in the state.

433 We need the taxes provided by mining company in the area to provide the revenue to support schools and county government functions. As a retiree living in the area, we can not afford to have our taxes increase.

435 A 20-yr withdrawal would deny good high paying job opportunities for workers and their families and would restrict generation of tax revenues to the State of Montana, Cooke City and Park County. Serious ramification's would be imposed upon school and County governmental operation's and taxes. Such removal and transfer of properties to Federal ownership would reduce current assessed valuation to Park Counties tax rolls, and remaining business and residential owners in the affected area would be faced with increased burdens to make up the difference through higher taxes. **(Also comments 317, 373, 386, 433)**

472 We couldn't afford to pay the property taxes in Park County, Wyoming if the majority of the revenue were not collected by the county from the industrial companies. They pay the greater part of all revenues which support the schools, roads, and civic governments. Although the mining area is in Montana, we do not wish to have the environmentalist movement set the precedent for removing industrial companies from any state's tax base. Without the mine, Montana stands to lose many millions of dollars in revenue. With the oil industry paying less in revenue each year in Park County, Wyoming, we need more not fewer, industrial businesses.

Agencies' Response:

The effects of the proposed action and its alternatives on government finances, including the effects of financing local school systems, are discussed in Chapter 3, "ECONOMICS, Government Finances, Environmental Effects" of the Final EIS. Tables 3-13 and 3-14 show that beginning in Year Four of a potential project significant net revenues would accrue to Park County, Montana, and Park County School District. By Year Six this would have reached approximately one million dollars per year. However, the decision to apply this surplus to the reduction of property taxes would have to be made by local government or voters. The conclusions from this analysis show that Park County, Montana, will realize more revenues and expenses from the result of mining, but Park County, Wyoming, will end up with a net loss.

Federal lands being withdrawn from mineral entry are not included in the present assessed evaluation of Park County, Montana, or Park County, Wyoming. If Crown Butte's property is acquired by the federal government, and withdrawn from mineral entry, Park County, Montana, will lose the assessed valuation of that property. However, this will be the result of the land exchange proposal, not the mineral withdrawal proposal. It is also possible that the conversion of private to federal land would increase the amount of "Payment in Lieu of Taxes" (PILT) payments to Park County, Montana.

Comment:

393 pg 132 RITT Tax: A portion of the Metal Mines License Tax is set aside for the RITT. Therefore, this section is in error.

Agencies' Response:

The "RITT Tax" no longer exists. However, it was absorbed by an adjustment to the Metal Mines License Tax, and 15 percent of the collection is set aside to the RITT Trust Fund. The Final EIS has been updated to make this more clear.

GENERAL COMMENTS/OPINIONS EXPRESSED ABOUT ECONOMICS

403 Thank goodness Park County will not have the expense of cleaning up after the mining, which you project would bring in $1.2 million. That $1.2 million would be a drop in the bucket of what the cost of the expense will be to clean you up.

379 ...these lands bring large amounts of income to our state in many different ways.

374 ...several billion dollars of wealth will have been added to the economy by the mining activity.

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

SOCIAL

QUALITY OF LIFE

Comment:

498 I have noted two errors relevant to my research which is referenced in the Recreation, Economics, and Social analysis sections. Specifically, on

page 141, the last paragraph of the left column, the text refers to survey results from my research without reference. The paragraph before refers to results from the 1990 Crown Butte Survey. But in the last paragraph, the second sentence, which begins with "Residents were asked...," through the end of that paragraph, reports results from my survey.

Similarly, in the next paragraph, the first in the right column of page 141, the fourth sentence which begins with "Of year-round residents responding" through the end of that paragraph, is also referring to results from my survey.

Agencies' Response:

This oversight has been corrected in the Final EIS.

Comment:

498 I also believe that if the authors of this section take into account the different findings of these two surveys, they may want to redraft their conclusions. Specifically, in the second paragraph of page 141, the text refers to result from the Crown Butte Survey (without reference) on the community's beliefs in the distribution of power and resources affecting the community. However, if one compares those results to a very similar question in my survey which repeated these choices but included the New World Mine, the conclusion might be far different. The question asked about the future power distribution if the mine was permitted, and almost two-thirds of the respondents chose "Crown Butte Mines/Noranda."

Agencies' Response:

This comment has been incorporated into the text of the Final EIS.

Comment:

498 Similarly if one compares the first sentence of the next to last paragraph of the left column of page 141, which states, "A 1990 Crown Butte Survey showed the existence of concerns dealing with a lack of community togetherness to the results from a similar question in my survey, (some of the results of which are reported in the next two paragraphs referred to above), one would conclude that the concerns about community togetherness are dwarfed by the concern over potential mining. As is discussed in my research, the 1990 Crown Butte Survey reported results from many open-ended questions such as community concerns. While they identified which concerns were raised, their conclusions can not be verified due to selective reporting, the question format, and the destruction of the original data. In my closed-ended question, I included the concerns identified in their survey, and found that though the lack of community togetherness may be the second greatest concern, the magnitude of that concern is not great, especially when compared the potential of mining, which was cited by a majority of the respondents to my question.

Agencies' Response:

The results of both surveys addressed in this comment are discussed under "Social," in the "Quality of Life" section, "Affected Environment, Park County, Montana."

Comment:

485 In addition, mining would result in a sudden and drastic alteration of the social fabric and character of the Cook City/Silver Gate communities; that which attracted most of the year-around and seasonal residents originally.

Agencies' Response:

Potential changes to the quality of life are discussed under "Social," " Quality of Life," "Environmental Effects."

Comment:

485 Further, a "boom town" economy driven by a mining industry would undoubtedly attract new corporation backed businesses, displacing many of the long standing locally owned businesses.

Agencies' Response:

The growth in consumer demand for retail products by mining employees would be insignificant compared to those demanded by a growing tourism industry. If anything, the year round presence of mining would allow retail stores to stay open for a greater part of the year. Also, this type of situation is mitigatable with agreements not to compete with existing retail businesses.

Comment:

498 On page 147, right column, fourth full paragraph, I also suggest that the consequences of the construction of a sewage treatment plant be discussed. In my conversations with residents, there was general agreement that construction of a sewage treatment plant would cause tremendous and irreversible housing growth, especially in Cooke City where two of three city lots are undeveloped,

V20

largely for this reason. Construction of the sewage plant, and more fundamentally, political control of the sewage district, are thus key thresholds to explosive growth in Cooke City, which could be passed with the small number of mining households that are projected.

Agencies' Response:

Although it is true that the current lack of a sewage treatment facility is a major limiting factor on the potential for growth in the Cooke City/Silver Gate area, we do not feel that construction of a sewage treatment plant would result in explosive growth due to other limiting factors that are more difficult and/or costly to address.

The first of these is the limits on available water for domestic use. The Reserved Rights Compact between the United States and Montana severely limits the potential for any significant increase in domestic water usage in the Soda Butte drainage. If water were to be piped in from another drainage, the closest logical choice would be the Fisher Creek drainage. However, the water quality there, due to chemical concentrations, is unsuitable for domestic use. The next logical choice would be to pipe water in from the Clarks Fork River. Although water quality in the Clarks Fork is better, such an operation would not be easily accomplished because of the need to pump up hill. Additionally, the operations would be subject to extremes of weather and climate that would be very costly to address.

The second limiting factor is the lack of available land for development. Even if adequate water and sewage treatment were available, there is relatively little private land available that could be developed.

Comment:

485 Rapid growth in population and demand for services in the area that would be associated with mining development, facilitated by Alternative A, would undoubtedly strain all forms of local infrastructure. This potential rapid growth would require a large investment by the local residents and Park County to upgrade facilities that are presently adequate.

Agencies' Response:

The effects on area infrastructure are discussed under "Social," "Community Services and Infrastructure," "Environmental Effects" and effects on government finances are discussed under "Economics," "Government Finances." As described on these pages, fiscal effects not mitigated through increased tax revenues resulting from mining activities and from the use of revenue from Montana's metal mines license tax, could be mitigated through a negotiated Impact Plan as required by Montana's Hard-Rock Mining Impact Act. Through this plan, the mining company would agree to cover these costs. However, it is possible that a company would be exempt from the requirement to negotiate an impact plan if they employ less than 75 persons during a six-month period. In this case, the additional costs would fall on Park County and be passed on to residents through increased tax levies.

Comment:

392 Although mining and increase population would create more demand for services, the impact would not be incurred by the local government. Under Montana's Hardrock Impact Board, those changes (both at the beginning and end of operations) are paid for by the company.

Agencies' Response:

The impact on government finances for Park County, Montana is discussed in the Final EIS in Chapter 3, Section on "Economics," "Government Finances," "Environmental Effects." The effects of the Montana Hard-Rock Mining Impact Act are discussed in Chapter 3, "Economics," "Mitigation of Effects." Tables 3-13 and 3-14 show that reimbursement to Park County, Montana might be necessary for the first three years of a project.

The effects on the area's infrastructure are discussed under "Social, Community Services and Infrastructure," "Environmental Effects." It is true that Montana's Hard-Rock Mining Impact Act requires the negotiation of an Impact Plan between the affected local governments and large-scale mines to identify the number of people expected to move into the affected area, the increased need for local government services and facilities, and the increased capital, operating and net operating costs that will result from the new mineral development. In this plan, the developer must commit to pay all increased local government capital and net operating costs identified in the Plan. However, in the event that the developer

does not meet the definition of a "large-scale" mine, which is that it employs more than 75 persons during any consecutive six-month period, the developer would be exempt from these requirements.

Comment:

439 page 146, Water, Wastewater, and Solid Waste disposal, 6th paragraph——There seems to be a contradiction here. The first sentence states that solid wastes are disposed of at a disposal site on Forest Service land. The second sentence states that Yellowstone NP collects solid waste year round and haul it to Livingston. Clarify.

Agencies' Response:

Park County operates a green box disposal site on Forest Service land near Cooke City. Yellowstone National Park collects the solid wastes from this site and hauls them to Livingston for incineration. This has been clarified in the Final EIS.

Comment:

439 Page 147, Environmental Effects of Alternative A-1, Road Maintenance, 1st paragraph——Since Alternative A-1 assumes that development of the NWP is anticipated and that the Cooke City to Cody highway would be open year round, it would be more correct to state that mining activities would rather than could require increased road maintenance and plowing from Cooke City to Cody.

Page 148, Environmental Effects of Alternative A-1, Road Maintenance, 3rd paragraph—Year-round access between Cooke City and Cody would rather than could increase recreational/tourist travel during the winter.

Agencies' Response:

These suggestions have been incorporated into the Final EIS.

Comment:

439 Page 148, Environmental Effects of Alternative B-2——It seems incorrect to state that cumulative effects under Alternative A-1 (NWM Agreement not implemented) would also occur under Alternative B-2 (NWM Agreement implemented). For example, under B-2 no mining is anticipated, thus the Cooke City to Cody highway would not be open during winter.

Agencies' Response:

The Final EIS has been revised accordingly.

GENERAL COMMENTS/OPINIONS EXPRESSED ABOUT SOCIAL

Comment:

486 Equally important, the withdrawal will help to preserve the social structure, character, and quality of life now stable in our small communities. Large-scale mining would bring destructive rapid growth beyond that which we can tolerate and still maintain our cultural integrity.

415 It is a source of enjoyment for those seeking peace and quiet and a chance to "get away" from noise and crowds. A place to marvel at the beauty of nature-which is much more precious than gold, by far!

351 ...[the withdrawal] is critical to prevent another mining company from ...attempting to mine in this critical area. **(Also comment letter 381)**

344 ...this area should be preserved for the future **(Also comment letters 426, 308)**

357 Our public lands should be protected for all of our enjoyment, and the habitat that we save will be able to be shared forever, with our friends, tourists, children, and the wildlife.

483 Mineral development, and all that it entails, in this area contradicts the very reasons that most of us live in and other visit the area.

393 I firmly believe this alternative to withdraw...is a very wise and important step in... maintaining the quality of life and socio-economic structure of Cooke City.

450 There is no question that quality of life would deteriorate with increased traffic, housing sprawl, boom and bust entry and exit from communities, demands on current infrastructure and government services.

456 To this list, could be added the economic and social disruption to the Cooke City/Silver Gate communities, for which federal land management policies are so pivotal...

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

CULTURAL RESOURCES

Comment:

450 The primary "cultural" value is the natural relatively undisturbed features of the area. Any intrusion on these features would be an irreversible permanent impact.

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

WILDLIFE AND SENSITIVE PLANTS

GRIZZLY BEAR

Comment:

439 Pg 160, Col 2, Paragraph 1, Grizzly Bear, Affected Environment, Study Area, "Since the Cooke City/Silver Gate area is considered to be a population sink for grizzly bears, the DEIS should have provided some data to indicate the amount of grizzly mortality that has been attributed to human activities in that region."

Agencies' Response:

Site-specific numbers for grizzly bear mortality were not determined for the project area. However, the topic of the relative number of grizzly bear mortality that has been attributed to human activities in the Cooke City/Silver Gate area was addressed under "Mortality/Habituation":

"The number of human-caused grizzly bear mortalities is positively correlated both spatially and temporally with increased human access and activity and the resulting increased contact between bears and humans. ..." and the following paragraph on habituated or food-conditioned grizzly bears.

Numbers for grizzly bear mortality in Yellowstone NP were taken from Knight, Blanchard, and Eberhardt, 1988, which is also in the project file for the CCAMW EIS.

Comment:

439 Page 161, Grizzly Bear, Hiding and Security, 3rd paragraph of DEIS, "The fact that skiing occurs at high elevations in core areas during spring suggests that snowmobiling could also occur. The DEIS should have specifically indicated if snowmobiling does or does not occur in core areas in spring, and if it does occur, the relative amount of such use should have been indicated. Snowmobiling could have a more wide spread impact than skiing due to the much larger areas that snowmobiles can cover in a short time both by their presence and their noise."

Agencies' Response:

The following editorial change has been made in Chapter 3, "WILDLIFE," "Hiding and Security" (underlined text):

"The extent of core area changes seasonally primarily due to seasonal trail use involving hiking, skiing, snowmobiling, or hunting activities. ... During the spring, at the high elevations in the Cooke City area, skiing, and snowmobiling are the primary form of recreation. ..."

Comment:

424 The areas is Management Situation 1 grizzly bear habitat. Alternative B in the DEIS complies with the Gallatin Forest Plan Amendment 19. Significant mining activity would increase the potential for bear and human interaction causing bears to become habituated which, in turn, has been shown to increase the mortality rates for bears. In addition, increase exploration and mining activity could disturb denning areas.

There are other significant Endangered, Threatened, Sensitive or Experimental populations of wildlife in the Withdrawal Area. These are Bald eagles, Peregrine falcons, Grey wolves, Wolverine and Lynx. Mining activity could have significant negative impacts on these recovering species

Agencies' Response:

The topic of Endangered and Threatened species (grizzly bear, gray wolf, bald eagle, peregrine falcon) is addressed in Chapter 3 of the Final EIS under "WILDLIFE," "Wildlife and Sensitive Plants" and in Appendix E, "Biological Assessment." Additional information on

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these and other species is included in the CCAMW DEIS Wildlife Technical Report (Sasse, Nov. 29, 1996).

Comment:

500 Comment provides additional information on grizzly bear and a copy of the following document: Mattson, D. J. , 1995. Impacts of the proposed New World Mine on Yellowstone's Threatened grizzly bear population. World Heritage Committee hears: Yellowstone National Park, World Heritage Site in Danger designation. 11 September 1995, Mammoth, Wyoming, USA

Agencies' Response:

The document "Mattson, 1995," has been considered and added to CCAMW EIS project file under sub-heading "Grizzly Bear."

GRAY WOLF

Comment:

439 Page 166, Gray Wolf, Summary of Effects, 1st paragraph of DEIS. The DEIS should have pointed out that the absence of cattle and domestic sheep grazing in the study area reduces the likelihood of conflicts that could result in wolf mortality and/or hinder their use of the study area.

Agencies' Response:

The following editorial change (underlined text) has been made in Chapter 3 of the Final EIS under "WILDLIFE," "Gray Wolf":

"Potential wolf use of the study area would coincide with the presence of ungulates on seasonal ranges. The absence of cattle and domestic sheep grazing in the study area reduces the likelihood of conflicts that could result in wolf mortality and or hinder their use of the study area."

GENERAL COMMENTS/OPINIONS EXPRESSED ABOUT THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Comment:

482 ...much of the area is prime grizzly bear habitat necessary to allow the recovery goals of the USFWS (for the bears' population in the greater Yellowstone ecosystem) to be met.

501 Grizzly bears, (introduced) wolves, and bald eagles frequent the area in question. For these species to survive, contact with human beings must be kept to a minimum. Their habitat must be spared from development wherever and whenever possible.

476 ...the habitat for so much great wildlife...especially the grizzly bear and the gray wolf...must be protected.

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

MOOSE

Comment:

360 I know the fires of 88 played a big part in Moose population here but have seen a slow, steady decrease in Moose numbers. Some due to habitat loss (development-homes, business, etc) logging and a couple extra hard winters, this winter of 96-97 being the worst. More loss of habitat in the NWM/Withdrawal area certainly could add to this decline. (Moose hunting permits should be reduced! I realize that is not your problem.)

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal

BIGHORN SHEEP

Comment:

439 Page 174, Bighorn Sheep, Affected Environment. The DEIS fails to mention the critical importance of winter range to bighorn sheep and fails to point out that bighorn sheep winter range occurs within the study area in the area with the highest potential and development of the New World Project (Map 3-19).

Agencies' Response:

In response to this comment, the following editorial change (underlined text) has been made in Chapter 3 of the Final EIS under "WILDLIFE," "Bighorn Sheep," "Affected Environment":

"... West Rosebud sheep to summer range. A small number of bighorn sheep occasionally remain and overwinter atop Henderson Moun-

tain. These animals are restricted by deep snow to high elevation, windswept alpine grasslands habitats during the winter. The winter range area is located within the high mineral potential area."

Comment:
439 Summary of Effects, 2nd paragraph on page 175 of DEIS. The DEIS fails to adequately discuss the impacts of the New World Project on bighorn sheep winter range on Henderson Mountain.

Agencies' Response:
The following change (underlined text) has been made in Chapter 3 under "WILDLIFE," "Bighorn Sheep":

"Bighorn sheep range and movement corridors are located in areas of high mineral potential including Fisher and Henderson Mountain. Bighorn sheep winter range on Henderson Mountain is also located within the high mineral potential area. Development of the NWP could affect habitat in these areas."

BISON

Comment:
439 Page 178, Bison, Summary of Effects, of DEIS. The DEIS should have pointed out that movement of bison on plowed roads from Yellowstone National Park over Colter Pass and beyond would require the bison to move through the Cooke City and Silver Gate town sites on the plowed highway, streets, and private lands. In contrast to the statement in the DEIS, it seems likely that this potential movement corridor would directly effect the Yellowstone bison population due to mortality of nuisance bison in the Cooke City/Silver Gate area and bison mortality from collisions with vehicles on the plowed highway east of Cooke City. Whether or not such mortality would have significant population consequences is a separate issue.

Agencies' Response:
The following change (underlined text) has been made in Chapter 3 under "WILDLIFE," "Bison":

"If this road is plowed, bison may migrate along plowed highways and streets from YNP through Silver Gate and Cooke City and into the Sunlight Basin of Wyoming. This is a concern, in part, because Yellowstone bison carry the brucella virus."

"Bison movement out of Yellowstone NP during the winter into previously unoccupied areas of northwest Wyoming, however, has implications with regard to potential conflicts with private lands in Wyoming, including damage to fences, consumption of hay, occasional hazard to people and vehicle traffic, possible transmission of brucellosis to cattle. Potential conflicts may also result in bison mortality resulting from collisions with vehicles and government control actions."

OTHER WILDLIFE SPECIES

Comment:
360 Mountain lions have been seen between Silver Gate and Cooke City and up on Mineral Mountain, and the past several years and tracks seen - usually in the spring - yearly.

Agencies' Response:
The mountain lion was not an identified Federally listed Threatened or Endangered Species, a USFS Northern Region sensitive species, or Forest Plan Management Indicator Species. Effects on mountain lion and habitat were considered indirectly through the analysis of effects on TES, and Forest Plan Management Indicator Species.

Comment:
360 Fishers are apparently in the area having been photographed on Republic Mountain recently.

Agencies' Response:
The following changes have been made in the Final EIS in response to your comment. In Chapter 3 under "WILDLIFE," in Table 3-22 "Fisher" has been added after Lynx, and the following underlined text has been added under "Lynx" as follows:
Two anecdotal observations have been made of fisher adjacent to the project area, but the status of this animal has not been substantiated in the study area. Habitat for fisher (Douglas and Stickland, 1987) is similar to mature forest habitat component for lynx; unsuitable habitat for lynx previously discussed is also unsuitable for fisher."

"If a powerline is constructed into Wyoming, lynx denning habitat (mature forest) and po-

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tential fisher habitat would be converted to grass/shrub/sapling dominated vegetation for the next 20 years."

"The potential effects of increased human population, access roads for trappers and trapping mortality previously discussed under Wolverine would also apply to lynx and potentially to fisher."

"Under Scenario B-2, existing lynx and potential fisher habitat and levels of trapping would not likely change as a result of future mining.'"

Additional information is contained in the CCAMW EIS Project File (see Fisher).

Comment:

360 I personally have seen Pygmy Owls, Great Gray Owls, Boreal Owls here at my house. (Check with Dan or Cindy Hartman, Silver Gate to verify these sightings. They have seen and photographed these owls plus the saw-whet near Silver Gate.) Great horned owls nested above my house before the 88 fires and are still nearby but lost a great deal of their nesting places.

Agencies' Response:

The boreal owl is discussed Table 3-24, and additional information is contained in the CCAMW Project File. Effects on other owl species and habitat was considered indirectly through the analysis of effects on TES, and Forest Plan Management Indicator Species.

Comment:

360 Song birds (migratory) population had decreased drastically in the ten years I've been here. Surely more loss of habitat would add to that decrease.

Agencies' Response:

The subject of migratory song birds, Neo-tropical migrant birds is addressed in the Final EIS and in documentation in the project file. "Additional Sub-issues Analyzed" in the "Wildlife Technical Report" (Sasse, November 29, 1996, Project File) includes an analysis of neo-tropical migratory birds, risk of toxic materials to wildlife, and noxious weeds." The "Wildlife Technical Report" is located in the project file for the CCAMW EIS.

Comment:

360 Pine martens were common visitors during the winter until a section of mostly burned timber (private land) near Silver Gate was logged 2 or 3 years ago. Some snags and live trees were to be left, but were not. Martens rarely seen in our neighborhood now.

Agencies' Response:

Marten were discussed in Chapter 3 of the Final EIS under "WILDLIFE," "Additional Management Indicator Species Analysis." Additional information about Marten is contained in the project file.

Comment:

360 Quite possible that there is the "Rocky MT fox and possibly an "Ice Age Fox." Last of all, for years 7 years my neighbors Dan and Cindy Hartman have observed what may be a special Rocky Mountain Fox (Foxes). PLEASE SEE THE APRIL 1997 NATIONAL GEOGRAPHIC. We've been convinced for years this "Red" fox is not the same as the low country Red Fox and may as some of the researchers believe, be an "ice age" fox. They come down to lower elevations in the winter months and usually go back to higher elevations in summer. I know a den with young was found by researchers up Daisy Pass and have personally seen these foxes up near Long Lake shortly after Beartooth Highway was opened in late May. For the past 3 summers one pair has stayed near here and reasonably sure have raised young but as I said they usually go back to higher elevations for the summer. The possibility of this special Fox being in the withdrawal and NWM areas should be mentioned. National Wildlife Magazine is considering an article later this year - 1997 or early 1998. Again, this Fox is not a low land Red Fox. They could not survive in this climate."

Agencies' Response:

Ice age foxes are a sub-species of red fox. They are not considered sensitive species by the Northern Region of the Forest Service, nor are they limited to this area.

The red fox was considered in this analysis and discussed in the Wildlife Technical Report (Tyers, August 21, 1996, P. 92) completed for the New World Project EIS. Additional information on the red fox can be found in the project file for this EIS under Wildlife, phone logs with Larry Roop, WY Game and Fish, Dept., 12-17-96, P. 2.

The red fox was not an identified Federally listed threatened or endangered species, USFS

Northern Region sensitive species, or Forest Plan Management Indicator Species. Effects on red fox and habitat was considered indirectly through the analysis of effects on Threatened, Endangered, and Sensitive Species in the Forest Plan.

GENERAL WILDLIFE

Comment:

392 Chapter 1, Purpose and Need for Action - Wildlife: This section infers that the *wildlife* would be impacted by mining. As demonstrated at other Montana mines, each mine site, because of permit restrictions and safety is closed to hunting and public incursions. The sites become wildlife preserves causing far less impact on the wildlife than the public recreation areas. "

Agencies' Response:

Each mine site in Montana is unique based on factors including, but not limited to proximity to established communities, access by roads, minerals, adjacent land ownership and access rights, access by road, mining techniques, acid rock drainage, elevation, precipitation, proximity to surface water, wildlife habitat and species present (including Threatened, Endangered, and R-1 Sensitive), level of recreational use, Montana Department of Fish, Wildlife, and Parks hunting regulations, etc. It is beyond the scope of the CCAMW EIS to evaluate the effect of other Montana mines on wildlife or wildlife habitat. The larger spacial issue in CCAMW EIS is that the dispersed human activity beyond the physical context of the mine area will offset any asserted potential benefits from the mine associated wildlife refugia.

Comment:

433 The wildlife of the Cooke City area move to the valleys in the winter so they are not hurt by mining.

Agencies' Response:

Effects of mining to wildlife and habitat are not limited to winter range or the species being absent from the study area during the winter.

Comment:

303 As for wildlife, they adjust, we have deer around our homes in Cody. West Yellowstone have elk and others. We live with elk, deer, bear, moose and numerous small animals in the Sunlight Crandall area. Many species of wildlife live around the ponds at well sites all over Wyoming.

Agencies' Response:

Deer are generally more tolerant than several other species discussed in the Final EIS. The Final EIS has analyzed effects of mining-related actions on wildlife and habitat. Some species are more tolerant and others less tolerant to the effects of mining.

Comment:

488 The area has also been, and is, extensively used by various multiple use groups which affect the ecosystem. These activities have many of the same impacts on wildlife as would any mining operation in the area, in some instances possibly more impact since the uses impact a much greater segment of the area. A more detailed analysis of the impact of these types of use must be made for comparison to that of mining on the fish, fowl and wildlife in the area.

Agencies' Response:

The Final EIS discusses impacts of various multiple use groups in Chapter 3 under the sections on "Recreation," "Scenic" and "Special Areas," and "Yellowstone Park." Also, there is reference to human activity in the "Wildlife" and "Sensitive Plants" sections of Chapter 3. For example, human activity is discussed under "USFS Management Indicator Species" and under "Grizzly Bear." The "Grizzly Bear" cumulative effects model considers all human activity.

Comment:

439 Page 178 Additional Management Indicator Species Analysis plus Additional sub-Issues Analyzed, of DEIS. Is the Wildlife Technical Report referred to elsewhere in the section on USFS sensitive species? If they are the same, a consistent citation should be used, preferably the NWP PDEIS Wildlife Technical Report accompanied by the year of preparation.

Agencies' Response:

The convention used for citing Wildlife Technical Reports in the Final EIS is as follows:

NWP PDEIS, Wildlife Technical Report (Tyers, Aug. 21, 1996)

CCAMW PDEIS, Wildlife Technical Report (Sasse, Nov. 29, 1996)

Comment:

507 The CCAMW, P. 174, under Summary of Effects, states, "Future mining in the area could result in direct loss of habitat due to locations of facilities, and increased access due to mining related roads." How many acres is this? What % of the total proposed 23,680 acres of land is this?

Agencies' Response:

It is not within the scope of a policy-level analysis, such as the CCAMW EIS, to quantify total acres of habitat loss due to the absence of site specific information on reasonably foreseeable mine related actions. Examples given for New World Project for other wildlife species give an approximation of what would occur if that project was developed. Actual impacts of other mines would depend on several factors including the type of vegetation altered, the proximity to human activity (including roads), and the relative elevation within the study area.

GENERAL COMMENTS/OPINIONS EXPRESSED ABOUT WILDLIFE

Comments

366 (protect)...the wildlife species whose natural habitat this is.

476 This is land not inhabited by humans, providing habitat for the grizzly bears, as well as the gray wolf, bald eagle, peregrine falcons, and other animals that pass through the areas. I speak for the animals when I say they do not want their home turned into a mining site. We can't keep pushing them into a smaller and smaller area.

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

SENSITIVE PLANTS

Comment:

490 In the wildlife section, four threatened and endangered species (all animals) were listed for this study area. Separate subsections list faunal and floral species which are sensitive or rare in the study area. However, it was not clear to me if there are any threatened or endangered plants in the study area. Could a few sentences be added in the Wildlife section to clarify this question?

Agencies' Response:

When federally listed threatened and endangered plant species are present, they are identified in a list provided by the USFWS. No federally threatened or endangered plants where identified in the study area by the USFWS.

REQUIRED DISCLOSURES

Comment:

439 Page 179, Short-term vs. Maintenance and Enhancement of Long-term Productivity——The DEIS should have more accurately stated that a mineral withdrawal would reduce rather than affect short-term uses related to mining. The definition of "short-term" here seems to conflict with the use of "short-term" elsewhere in the DEIS.

439 Page 179, Probably Adverse Environmental Effects That Cannot Be Avoided, 2nd paragraph—— The DEIS should have pointed out that even mining development on private land in the study area could be avoided in the same way that development of the New World Project is proposed to be avoided by the NWM Agreement, or by other means such as condemnation and purchase of development rights, etc.

Agencies' Response:

"Reduce" was substituted for "affect" in the sentence referred to in the first comment in this section. "Probable Adverse Environmental Effects That Cannot Be Avoided" relate to implementation of a mineral withdrawal, not to other actions that could occur in the area; therefore, no change was made in the text in response to the second comment.

GENERAL COMMENTS/OPINIONS ABOUT CHAPTER 3 TOPICS

Comments:

306 [the withdrawal] would protect air and/or water quality, prevent noise/light pollution, water rights, recreation use, scenery, wetlands, aquatic environments, tourism, wildlife and their habitats.. **(484, 446, 448, 476, 477, 482,, 483, 409, 389, 399, 400, 411, 412, 414, 415, 426, 432, 377, 350, 352, 418, 356, 368, 336, 346, 349, 323, 326, 467, 398, 314, 313, 451, 475, 454, 428, 365, 354, 401, 468, 417, 425, 436, 355, 335, 438, 455, 458, 450, 307, 377, 332)**

Y25

410 We have no right to destroy something that can neither be restored or ever be replaced.

Agencies' Response:

Thank you for your comment. It will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

CHAPTER 4 CONSULTATION AND COORDINATION

EXTERNAL-GENERAL PUBLIC

Comment:

408 If there had been a open forum where ideas could have been expressed as well as questions answered. But I understand that none of you want to be on the hot seat and have to answer questions, that there is no answer to, like reclamation and recovery of healthy land after the flash in the pan millions have been taken to Canada.

397 On 3/21/97, I spoke with my brother Silas Counts, of Livingston, Montana and he stated that our other brother Steven counts, also of Livingston had received the Summary of the Draft EIS for the CCAMW. Silas gave me the number for Larry Timchak, a member of the CCAMW Team, and I spoke with Rita Frasure requesting that copies of the Draft and summary be provided to members of my family. I gave Ms. Frasure the names and addresses of all my siblings with interest in the property at Cooke City. Ms Frasure stated that they had used the tax records for identifying individuals to mail the Summary EIS to. I received the information on Tuesday, March 24, 1997.

The Deed of Mining Claim recorded with County Clerk, Park County has recorded all of the names of my brothers and sisters for the 119 3/4 acres we own in the proposed Mineral Withdrawal area.

(Pg 181 Draft EIS): "During the week of June 10, 1996, CCAMW team co-leaders from the FS and BLM telephoned known area claimholders, ...who were known to have interests in the Cooke City area. These calls were intended to let these parties know that the agencies were initiating the proposed mineral withdrawal process for the Cooke City area, alert them to the time frames projected, solicit their participation, and encourage them to let others know about the process and how they, too, could become involved.? To my knowledge, no member of my family had been notified. I specifically never received any notification about the proposed mineral withdrawal until 3/21/97, via a phone call from my brother Silas Counts.

(Pg 181 Draft EIS) "An "interested party" letter was sent to over 1,000 individuals and organizations on June 14, 1996." To my knowledge, no member of my family received this "interested part" letter. I specifically never received the letter.

(Pg 182 Draft EIS under NWM Agreement, Modified Proposal, and Extended Public Scoping) "To meet the extent of this Agreement, the purpose and need for CCAMW were expanded. Approximately 40 additional responses were received during the extended scoping period. Issues raised during public scoping are discussed in Chapter 1." I was not aware of the process at all to comment

(Pg 182 Draft EIS) "On September 20, 1996, a notice of "Amendment to Proposed Withdrawal; Montana" was filed in the Federal Register, notifying the public that the BLM, with concurrence from the FS, had amended the petition and application for the proposed CCAMW... The modifications include withdrawal of any private lands and minerals that might be acquired in the study area in the future, either as a result of the New World Mine Agreement or from other willing sellers... I received no information concerning this amendment, nor was any member of my family approached as "other willing sellers".

(Pg 183 Draft EIS) "To ensure that no "immediately affected" individuals had been missed in the scoping process, on October 28, 1996, the lead agencies issued a letter to 383 people who were identified as owning property within the study area." To my knowledge, no member of my family received this letter. As a recorded owner on the Deed, I should have received notification.

The lead agencies for the EIS are the Dept of Agriculture, Forest Service (FS) and the Dept of Interior, Bureau of Land Management (BLM). Neither of these agencies, which were contacted by my family, through our congressional delegations, responded to our previous requests for information concerning issues dealing with our Cooke City property.

I am extremely disappointed and angry that I was not given the opportunity to participate in this process. My rights have been violated, proper notice was not given and these agencies had the information to contact me or my family. It is impossible that the CCAMW Team did not know of our existence. The Draft EIS maps (pgs 11, 15, and 16) clearly shows our property in the "most likely area of mineral activity." To still be waiting for a response, while all of these important issues and actions were being undertaken demonstrates, in my opinion, a purposeful and willful process of delaying, misleading and ignoring our valid concerns.

Agencies' Response:

The CCAMW team has strived to maintain an open process involving all interested parties. The mailing list for the proposed NWP served as the basis for initial public contact. Several newspaper articles appeared in the Livingston Enterprise, the hometown paper of Silas and Steven Counts. Public meetings were announced in the Livingston Enterprise and held in Livingston on July 18 and October 24, 1996; and on April 3, 1997. Silas Counts contacted the withdrawal team by phone in September of 1997 requesting information about the NWM Agreement and mineral withdrawal. A letter concerning the proposed mineral withdrawal was sent to 383 property owners identified by the Park County appraisers office, including Mr. John Counts whose address was listed as Livingston, MT, on October 28, 1996. This letter was not returned to us.

Comment:

439 Table 4-1, List of Preparers, of DEIS. The names Sasse, Shelly, and Shuler have the subscript "1" that apparently is intended to refer to a footnote, but no footnote is given in the table.

Agencies' Response:

This Table is now number 4-3. A footnote has been added -

1/. Preparers of the Biological Evaluation (USFS Sensitive Species) which has been incorporated into Chapter III of this EIS. Also see the Biological Assessment (Federally Listed Threatened and Endangered Species), Appendix E.

APPENDIX B: LOCATABLE MINERAL RESOURCES FORECAST FOR FUTURE MINERAL ACTIVITY

Comment:

505 A related problem is the Department's failure to justify the hypothetical forecast for future mineral activity that is the heart of the DEIS analysis. As the only company with a proposal for future mining development in the New World District, Crown Butte is in a unique position to comment on the scenarios. From our perspective, even though the potential for further development beyond the New World Project is small, the Department has overstated that potential. We recommend that the forecast probabilities for mines other than the New World Project be reduced by at least a factor of ten. To the extent that the DEIS is relying on the analysis cited from Peters, 1987, see DEIS at B-6, the DEIS has misapplied that analysis in two ways. First, it is inappropriate to use the terms "orebody" and "mine" interchangeably in this context, for the profitable development of any identified orebody (i.e., turning it into a mine) requires a site-specific assessment of the costs of mining and processing. These factors have not been taken into account in the DEIS hypothetical mining forecasts. Second, and more importantly, the probabilities from Peters are not directly transferable because they fail to take into account the political and permitting climate for mine development in the New World District. As the DEIS notes, the President himself has declared his concerns about mining in this area. Thus, as a practical matter, given the difficulties that Crown Butte has faced in permitting the New World Project, the strong and highly visible opposition to mining in the study area, and the fact that the Department has proposed and is considering withdrawing the entire area, from location under the mining laws, it is extremely unlikely that any company would be willing to undertake the time and expense of proposing a mine in the New World District. The probabilities for mineral development which might apply to mineral exploration and development generally cannot properly be applied to the New World District without explicit consideration of the factors that make this area unique and mine permitting particularly difficult.

505 The DEIS Fails To Provide an Adequate Discussion of Potential Impacts.

Aside from the proposed New World Project, the location of future mineral development is speculative." DEIS at 29.

489 The mineral potential of the New World District outside of the properties held by Crown Butte Mines has been greatly exaggerated in terms of both aerial extent, relevant geographic areas covered, and the actual mineral potential in your depiction's on Maps 2-4. Noranda-Crown Butte Mines extensively evaluated the mineral potential of the New World District from 1987-1995. The lands held by Crown Butte Mines contain the only areas of significant mineral potential within the New World district and the proposed withdrawal area. The only possible exceptions include the Republic Mine Area (south of Cooke City) and Goose Lake Area (located within the Beartooth-Absaroka Wilderness).

Agencies' Response:

These comments on mineral potential do not prompt a change in the document for the following reasons:

1)Map 3-11 depicts areas with various development potential and is in agreement with the commentor in that the area with the highest development potential is essentially Crown Butte's holdings.

2)The agencies' definition of development potential portrays the varying likelihood of a potential mineral occurrence (see Appendix B) being explored or developed within the next 20 years. The agencies feel it is reasonable that exploration or development would occur within the high and highest development potential areas shown on Map 3-11; thus, the qualifiers of high and highest development potential are appropriate.

3)Table 3-10 shows that the agencies' forecast and the commentor's future mine projections are in agreement. All anticipated mining is expected to occur within Crown Butte's holdings, with the exception of a relatively low probability of one underground mine that could be developed in the Republic Mountain area or possibly the Goose Lake area.

Again, since the affects analyses in the EIS are based on projected activities which the agencies and the commentor are in agreement, there are no changes needed in the document.

Commentors concerns about overstating the development potential, relative to the forecast activity, will be revisited by the decision maker in addressing risk and uncertainty.

Comment:

495 I disagree with the forecast that there is a 10% possibility that a surface mine will be developed within the area of the proposed mineral withdrawal. It might be interesting and informative for you to poll industry participants on their estimate of the likelihood that investment funds could be located for a such a venture, given Crown Butte's experiences.

Agencies' Response:

Geologic ore-grade reserves have been identified in the Como-McLaren area of Crown Butte's holdings (Table 3-9). Within the scope of this analysis, a surface mine is considered a possibility within the next 20 years if the NWM Agreement is not implemented and other mining is online. Federal and State law allows for surface mining in this area under certain conditions.

Comment:

495 I completely disagree with your forecast on page 133 of the DEIS, that a second underground mine prospect would result in the disturbance of 75 to 100 acres. If there is no withdrawal, and the New world mine goes forward, I assert that the most likely second underground mine prospect would be one discovered by horizontal or gently inclined drilling into the wall of the New World mine from its underground workings. The extra surface disturbance from such exploration would be zero. In all likelihood, the mine plan would consist of crosscuts from existing workings and the extra surface disturbance would, again, be practically nil.

Agencies' Response:

Appendix B, page B-8 suggests that the two hypothetical mines may use Crown Butte's proposed infrastructure, thus reducing the acres of disturbance. For Scenarios A-1 and B-1, these two mines would probably be within Crown Butte's holdings and use the existing infrastructure. However, there is a lower probability that an underground mine could be outside of Crown Butte's holding (probably in the Republic Mtn. area), thus we cannot eliminate the potential for disturbance.

For Scenario's A-1 and B-1, the analysis has been changed to reflect the lower range of disturbance (75 acres) for the second underground mine.

Probabilities and risks associated with the forecast activities and their environmental affects are disclosed within the EIS.

Comment:
495 This EIS will be fundamentally flawed until it clearly admits that the prospecting and mining ventures most likely to be stopped by this mineral withdrawal would be underground explorations with NO additional adverse environmental impact.

Agencies' Response:
The mineral activity forecast for the alternatives (Table 3-10) anticipates future exploration to focus on underground mining targets, most likely within Crown Butte, Inc., holdings as suggested in this comment. Because geologic ore-grade reserves for the Como and McLaren deposits have been defined (Table 3-9) and other underground potential exists within the study area, open-pit mining and other mining beyond Crown Butte's holdings is a possibility.

The effects of mining on other resources, for the various Scenarios, are disclosed in Chapter 3 of the Final EIS. The Secretary of the Interior will use this analysis and other factors, such as the NWM Agreement and valid existing rights under the Mining Law to make a decision on the proposed withdrawal.

Comment:
506 For internal consistency, the DEIS must presume at least one mine in Alternative B-2, plus several exploration programs, as over 2,400 acres would still be available for mineral development. This is validated by the federal assumption that one exploration program will occur (page 30, DEIS); ipso facto no one explores unless one intends to eventually mine. None of the data or analysis contained in Appendix B of the DEIS preclude the development of at least one mine under Alternative B-2.

Agencies' Response:
Although no mine development is forecast under Scenario B-2, the forecast does not preclude, nor indicate any intent to preclude additional mining on lands available for mining. If mining were to occur under this Scenario, the effects are adequately described under previous Scenarios. The actual effects would depend upon the size and location of a mine.

Comment:
500 Table 3-2, page 30: Under the columns for Scenario's A-2 and B-1, the Probabilities for Development for Underground mines and Surface mines are listed as "less than" (<), where the information in Appendix B lists these probabilities as "greater than" (>). There is probably a typographic error here.

Agencies' Response:
The information is correct. The probabilities of an underground mine under Alternative A-2, and a 2nd underground mine and a surface mine under Alternative B-1 are forecast to be less than Alternative A-1 (Appendix B) mainly because the amount of acres available for mineral exploration and development are decreased (see Table 3-9a).

Comment:
500 Appendix B, Forecast for Future Mineral Activity, page B-6: From the discussion in this section, the open pit mine postulated is most probably the McLaren and/or Como deposits.

Development of the McLaren and Como deposits as open pits, and any similar deposits as open pits, could lead to the exposure of extensive amounts of acid generating material, both as waste rock and in the pit walls. Development of an open pit mine in these locations could also impact the Miller Creek drainage leading into Yellowstone National Park, and the Stillwater River leading into the Absaroka-Beartooth Wilderness Area. Any open pit mining high in these drainages would lead to significant concern for water quality problems. These concerns, and some of the potential impacts, associated with open pit mining at the McLaren/Como locations are fairly predictable, yet were not developed in any detail in the EIS analyses. Open pit mining, especially if a larger orebody would be discovered, is one of the main concerns with potential mine development in the Cooke City area.

This concept should be developed more in this section (a potential size of 200-400 acres was predicted, see Table B-2), and carried through in the analysis in the body of the EIS.

432

Agencies' Response:

Appendix B, page B-8 suggests that the 2 hypothetical mines may use Crown Butte's proposed infrastructure, thus reducing the acres of disturbance. For Scenarios A-1 and B-1, these two mines would probably take place within Crown Butte's holdings and use the existing infrastructure. However, there is a lower probability that an underground mine could take place outside of Crown Butte's holding (probably in the Republic Mtn area), thus we cannot eliminate the potential for disturbance.

For Scenario's A-1 and B-1, the analyses has been changed to reflect the lower range of disturbance (75 acres) for the second underground mine.

Probabilities and risks associated with the forecast activities and their environmental affects are disclosed within the EIS.

The document has been revised to more properly analyze the impacts of surface mining in the area.

Comment:

500 Table B-2, page B-7: The Daisy Pass Pod is assigned a probability of likelihood of development of "greater than 1 in 10" (page B-6. Yet this development is not reflected in Table B-2, unless it is lumped in with the proposed New World Mine. If this is so, it should be noted. If the Daisy Pass Pod is to be considered as a separate underground (?) development, this should be reflected accordingly in the Table.

Agencies' Response:

The Daisy Pass Pod is a part of the Crown Butte mine proposal.

Comment:

500 Table 2-2, p.13: Listed in scenario's A-1, A-2, and B-1 is a projection that the probability for the development of additional underground mines is 2%. This figure is used in numerous tables throughout the DEIS.

It is assumed that this number comes from Table B-2, which lists the probability of additional underground mines and "greater than 1 in 50." This probability was evidently developed from the discussion on page B-6, where Peters (1987) is quoted as proposing this number. Therefore, a strict interpretation of the information in Table B-2 would be that the probability of development for additional underground mines is greater than 2% (but less than 10%).

In reality, there is probably significant potential for discovering additional skarn type mineralization in this area and possibly for discovery of porphyry mineralization closer to the magmatic bodies that drove the mineralizing events.

It is probably more accurate to say that the probability of another underground mine (the size of the New World Mine), or possibly expansion of the New World Mine underground to twice its proposed size, is "greater than 2%, or alternatively "between 2 and 10 percent."

Agencies' Response:

The future mineral activity forecast is based on the geologic and non-geologic assumptions and conditions specified in Appendix B. The statistics borrowed from Peters (1987), are used in the forecast only to illustrate relative (comparative) probabilities of various mining activities occurring within the study area within the next 20 years. Any further refinement of these probabilities would imply more accuracy than is justified.

Comment:

392 pg 43 The theory of up to 10 mineral exploration operations is very unlikely. Even when the excitement of discovery for Crown Butte was at its peak, there was very limited exploration in the district.

Agencies' Response:

Alternative B, Scenario B-1 anticipates 7 exploration operations as indicated in Table 3-2 of the Draft EIS (page 30). This error in the text has been corrected in the Final EIS. Combined exploration and development drilling by Crown Butte Mines, Inc., between 1987-92 was 295,375 feet in 87[illegible] holes (Appendix B). This information is the basis for projecting drilling activity for two additional hypothetical mines within the next 20 years which could include 700 development-drill holes and 100 exploration-drill holes for each new mine. The forecast under current management (Alternative A-1) of ten exploration projects (with 20 drill holes each) equates to 200 drill holes.

432

LEGISLATIVE CHANGES

Comment:

450 The 1872 Mining Act desperately needs revisions to prevent further patenting for less than compelling needs. **(Also comment letters 357, 403)**

339 The proliferation of mines and proposed mines demonstrates this need in view of Congress's failure to correct the 1872 mining law, so other measures must be taken to protect our water and other natural wonders.

Agencies' Response:

Thank you for your comment. It has been noted and will be considered as part of the record by the Secretary of the Interior when he makes a decision on the withdrawal proposal.

APPENDIX C: SUMMARY OF ASSUMPTIONS

Comment:

439 page C-1, Mineral Development Forecast, 3rd paragraph—Here development of the New World Project is assumed to be reasonably foreseeable, whereas the assumption for Alternatives A-1 and B-1 in many places in the DEIS is that the New World Project would be developed. Reconcile this terminology.

Agencies' Response:

For purposes of analysis, it is assumed that the NWP would be developed for Scenarios A-1 and B-1. Absent the NWM Agreement, it is assumed that the NWP is reasonably foreseeable because an application was pending. This terminology is accurate, because there is no assurance that the mine would be developed.

Comment:

439 page C-1, Other Reasonably Foreseeable Activities, Residential Development——The DEIS mentions increased demands for access to inholdings, apparently for the purpose of residential development. The DEIS should more explicitly state whether this applies to all or part of the considerable amount of patented land within the study area.

Agencies' Response:

Development activity has been concentrated along the US Highway 212 corridor. Anticipating future development is speculative, but it is reasonable to assume that, over time, demands to access private property will increase.

APPENDIX D: LANDSCAPE, SOILS, AND VEGETATION

Comment:

439 The DEIS inadequately addresses the effects on ecological factors such as upland vegetation and soils. Just including descriptions of landscapes, soils, and vegetation in Appendix D is insufficient.

Agencies' Response:

Upland vegetation and soils were not identified as major issues. Vegetation was considered in the "Wildlife" section. Specifically, effects on whitebark pine and sensitive plants. Implications of soils on reclamation was addressed in the "Land Use" section under "Reclamation Potential".

APPENDIX E: BIOLOGICAL ASSESSMENT

Comment:

439 page E-6, Effects of Implementation of the Preferred Alternative, Grizzly Bear, Conclusion——Up to this point in this description of the effects of the preferred alternative on grizzly bears all the statements about effects apparently apply to Alternative B whether or not the NWM Agreement is implemented. But in this Conclusion section, only the effects of Alternative B assuming the NWM Agreement is implemented (*i.e.*, Scenario B-2) are discussed. This is insufficient. If the effects of Scenario B-2 are specifically described, the effects of Scenario B-1 must also be discussed.

439 page E-7, Determination of Effect, 1st paragraph——Here again the discussion is relative to Alternative B with implementation of the NWM Agreement (Scenario B-2) rather than just Alternative B, Mineral Withdrawal.

Agencies' Response:

Determination of Effects apply to the preferred Alternative (Alt. B) which includes Scenario 1 or 2. The text in Appendix E, "Effects of Implementation of the Preferred Alternative" has been changed to read as follows:

434

Scenario B-1, NWM Agreement Not Implemented: Under this Scenario, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2) assumes the New World Project would be developed. In addition there is a 10 percent probability of a surface mine and a 2 percent probability of an another underground mine. Up to seven mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

Scenario B-2, NWM Agreement Implemented: The determination of effects are based on Alternative B (Mineral Withdrawal Implemented), and discussed in detail below and summarized in Table E-2. The determination of effect apply to either Scenario B-1 (NWM Agreement Not Implemented) or Scenario B-2 (NWM Agreement Implemented). The determination of effects was based on ..."

APPENDIX F: USFS MANAGEMENT INDICATOR SPECIES

Comment:

490 In Tables F-1 and F-2 in Appendix F, the term "C2" is listed as a USFWS status. Please include a short footnote or reference to the text which explains what this term means.

Agencies' Response:

The C2 or Category 2 has been dropped by the USFWS. Reference to C2 under column heading USFWS status in Table F-1 and F-2 has been deleted.

READER'S GUIDE

Comment:

500 Readers Guide (map side) All four maps, for both Alternatives A and B, contain the phrase "No Mineral Development" in the title block. The title blocks for Alternatives B-1 and B-2 should reflect the mineral withdrawal of federal lands.

Agencies' Response:

The map legends have been corrected for the Final EIS.

PROCESS

Comment:

507 Why does the "Withdrawal Checklist" being used for the CCAMW (Attachment #1) state under item #7; "Please note, the EA (EIS) is the primary supporting document which accompanies the PLO to the Secretary; [of Interior] therefore, it must support the proposed action as described in the PLO."?

Has it been directed, ordered, suggested or in any way implied to the Withdrawal Team that the CCAMW EIS will, shall or must support the CCAMW?

Agencies' Response:

The "Withdrawal Checklist" is a very abbreviated summary of the items listed in the withdrawal regulations, 43 CFR 2310. This is used as a "checklist" during the development and processing of a case file for submission to the Secretary of the Interior (CFR 2310.3-2). Included in the list of items to be submitted to the Secretary is an appropriate level NEPA analysis. The NEPA analysis for a withdrawal decision is supposed to address the anticipated impacts of the proposed mineral withdrawal and reasonable alternatives on cultural resources, identification of any roadless areas, a mineral report, assessment of threatened or endangered species, analysis of economic impacts on localities, and public participation. The NEPA analysis is supposed to assess the impacts of the proposed withdrawal and alternatives on these resources. Since the NEPA document, in this case the EIS, will be the primary source of information concerning impacts to these resources it is also supposed to accompany or be included in the case file that is submitted to the Secretary of the Interior.

There has been no order to or pressure on the interdisciplinary team of scientists and experts to arrive at predetermined conclusions concerning the analysis of impacts to the various resources mentioned above. It has not been directed, ordered, suggested, or implied in any way that the Interdisciplinary EIS Team must support the proposed withdrawal in the EIS.

Comment:

507 Comparing the CCAMW and the NWM PDEIS I have noticed that on MANY occasions the CCAMW has cited the NWM PDEIS but edited or worded the information in such a way as to favor the CCAMW.

Agencies' Response:

The NWP PDEIS was an important reference for the Withdrawal EIS. Material incorporated into the Withdrawal EIS has been edited, where appropriate, to reflect the programmatic, rather than the site-specific nature of the decision. Furthermore, specialists edited the text based on their best professional judgement.

Comment:

507 The CCAMW cites the NWM PDEIS numerous times, does the Withdrawal team consider the NWM PDEIS a credible source of information?

Agencies' Response:

Additional references were added to the Final EIS. The NWP PDEIS includes the most comprehensive and current data available for this area.

Comments:

506 NWMA finds that the DEIS does not meet the legally mandated requirements as set forth in the National Environmental Policy Act (NEPA), and as interpreted by the courts. Therefore, the Withdrawal Team is obligated to correct the deficiencies, as set forth below, and resubmit the DEIS to the public for review and comment prior to proceeding with the final document or any record of decision.

505 The DEIS Contains Errors and Omissions Which Make It Difficult To Understand.

The DEIS appears to have been prepared hastily or without adequate care and contains errors or omissions which are confusing or misleading. E.g., DEIS at 40 (discussion confuses water quantity and quality impacts); DEIS at 43 (analysis of Scenario B-1 is incorrect); DEIS at 149 (says that cumulative effects described in Scenario A-1 will occur in B-2; that doesn't make sense and is inconsistent with the final paragraph of the Conclusion on page 150).

488 The Draft Environmental Impact Statement is deficient or in error in numerous areas including "Purpose and Need", legal justification, proper environmental evaluation, proper and adequate economic and social evaluation, and Heritage Site/Biosphere Reserve analysis. Significant additional revision and/or analysis is required.

Agencies' Response:

One of the purposes of a Draft EIS is to provide for an opportunity to correct errors, omissions, and inconsistencies for the Final EIS. Many of the comments brought these to our attention and they will be corrected in the Final EIS.

Comment:

488 The **Mineral Exploration Coalition** has provided your Mineral Withdrawal Team with two previous letters addressing our concerns with the proposed mineral withdrawal. We wish to designate that both of these letters, dated July 17, 1996, and December 12, 1996, be included and made a part of our criticism of this Draft Environmental Impact Statement on the proposed mineral withdrawal. A great many concerns expressed in each of those two letters have not, in our opinion, been adequately addressed in the DEIS.

Agencies' Response:

Points or questions raised in your previous letters have been addressed in the Final EIS in one of two ways:

1) Revision to the text,
2) Response to public comments in Chapter 4 and Appendix I.

Comment:

478 Continued reference to the NW PDEIS and NW Tech documents without making those available to the public in a bibliography. Each document utilized in the agency decision making process must be listed and available for public review.

Agencies' Response:

The NWP PDEIS and the NWP Technical reports are available through the State of Montana, Department of Environmental Quality, Helena, Montana. Copies are also available for review at the Gallatin and Custer Forest Supervisors' Offices in Bozeman and Billings respectively and at the BLM State Office in Billings.

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GLOSSARY

Abundance and density - The total number of organisms of a type (e.g., total number of fish) inhabiting an area or found in a sample.

Acid Rock Drainage - Leaching from mining wastes, fill, etc. that results from production of mine water which contains free sulfuric acid, mainly due to the weathering of iron pyrites; where sulfide minerals breakdown under chemical influence of oxygen and water, the mine drainage becomes acidic and corrosive. A particular combination of sulfides, oxygen, iron bacteria (Thiobacillus ferrooxidans to sustain the reactions) and pH, must be present for acid conditions to be produced. Therefore, not all situations of exposed and weathering iron pyrite will produce acid rock drainage. (See more complete definition in water quality section.)

Active fault - A fault where movement is evident within the Holocene Period (~10,000 years before present).

Acutely toxic and acute toxicity - Concentrations of a chemical that kill 50 percent of organisms after a short-term exposure duration (generally 96 hours or less).

Adsorption - The adherence of molecules in solution to the surface of solids with which they are in contact.

Affected Environment - The biological, social, economic, and physical environment that will or may be changed by proposed actions.

Alluvial - Unconsolidated rock materials, including clay, silt, sand, and gravel, deposited by flowing water.

Aquatic - Related to the water and wetted environment associated with flowing and standing surface waters (lakes, streams, rivers, and reservoirs).

Aquatic Ecosystem - A stream channel, lake or estuary bed, the water itself, and the biotic communities that occur therein.

Aquifer - A formation or group of geologic formations that contains sufficient saturated permeable material to yield water to wells or springs. An aquifer is either confined or unconfined.

Confined - An aquifer which is bounded above and below by beds of distinctly lower permeability.

Unconfined - An aquifer where the water table is exposed to the atmosphere, usually with streamside areas.

Baseflow - A sustained dry weather flow of a stream, derived from ground water.

Bear Management Units (BMU's) - Bear Management Units are areas that are used by land management agencies for grizzly bear habitat evaluation and population monitoring.

Bedding plane - The division plane that separates successive layers or beds in stratified rocks.

Benthic - Related to the near-bottom environment of aquatic environments.

Benthic invertebrate - Communities of insects, worms, clams, and related animals that live in benthic environments.

Best Management Practices (BMP) - A practice or a combination of practices, that is determined by a State (or designated area-wide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practical means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals (40 CFR 130.2g).

Best Available Control Technology (BACT) - The best available air pollution control technology for a given purpose as stipulated by the Environmental Protection Agency (EPA).

Big Game - Those species of large mammals normally managed as a sport hunting resource.

Bioaccumulate and bioaccumulation - Tendency of chemicals in the environment to enter into organisms through their food or water where the chemicals remain and accumulate in tissues to concentrations potentially greater than found in the environments inhabited by the organisms.

Biodiversity - Variety of life and its ecological process.

Biological Assessment (BA) - A stand alone document which reviews all Forest Service planned, funded, executed or permitted programs and activities for possible effects on Federally listed threatened, endangered, proposed and candidate species as identified for the cumulative effects area in coordination with the USFWS. A Biological Assessment is used to satisfy consultation requirements with the USFWS for projects requiring an Environmental Impact Statement

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(Reference: Sec. 7, ESA; 50 CFR, 402.12, 1508.7, 1508.25, and 1508.27.). The Biological Assessment displays the Determination of Effects for the DEIS or FEIS preferred alternative. The Determination of Effects is limited to: (1.) No Effect; (2) Not likely to adversely affect; (3) * Likely to adversely affect; and (4) Beneficial effect. * = Considered a trigger for a significant action.

Biological Evaluation (BE) - Documentation on USFS sensitive species (animal and plant) contained within an EIS (see Table of Contents for: USFS sensitive species; List of Preparers). Documentation includes a review of USFS sensitive species present, their habitat, and document that addresses and identifies the Determination of Effects on these species. The USFWS review of the biological evaluation is addressed through public scoping and conducted in conjunction with over all agency review of the DEIS. Reference FSM 2673.4 - Biological Evaluations for Sensitive Species. The Determination of Effects is limited to: (1.) No impact; (2) May impact individuals, but is not likely to cause a trend to federal listing or loss of viability; (3) *Likely to result in a trend to federal listing or loss of viability; and (4) Beneficial impact. * = Considered a trigger for a significant action.

Biological Opinion - An official report by the US Fish and Wildlife Service (FWS) issued in response to a formal Forest Service request for consultation or conference. It states whether an action is likely to result in jeopardy to a species or adverse modification to its critical habitat.

Biotica - All the natural living organisms in a planning area and their life processes; b. Refers to living components of an ecosystem, e.g., plants and animals; c. Of non-living organisms in their ecological rather than their physiological relations; d. Pertaining to any aspect of life, especially to characteristics of entire populations or ecosystems.

Candidate species - These species are designated by the U.S. Fish and Wildlife Service as being candidates for listing as threatened and endangered under the Endangered Species Act.

Catastrophic natural forces - Forces resulting from natural occurrences (such as earthquakes and floods) that are of a magnitude that usually results in severe damage.

Chronically toxic and chronic toxicity - Concentrations of a chemical in water that kill organisms after long-term exposure (often months).

Class II - This class is intended to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III - This class is intended to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV - This class is intended to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the effect of these activities through careful location, minimal disturbance, and repeating the basic elements.

Closure - The administrative order that does not allow specified users in designated areas or on Forest development roads or trails.

Coarse fragment content - The volume of the soil greater than 2mm in size. If the coarse fragment content is greater than 50% by volume, the lead agencies consider it unsuitable for salvage unless soil materials are limited in the area.

Code of Federal Regulations (CFR) - Regulations developed at the Department level for the specific implementation of a Public Law. For example, 36 CFR 228 are the implementing regulations for the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGLRA).

Community - A group of populations living and interacting over a given area.

Consumptive use - A use of resources, such as water, which permanently reduces the supply.

Contributing site - Any historic property that contributes to the significance of a Historic District.

Cooperating agencies - Federal and State agencies (other than the lead agencies) that have jurisdiction by law or have special expertise with respect to the proposed action.

Core Ranges (Big game) - Those portions of home ranges of animals that receive disproportionately high seasonal use and therefore are deemed key habitat for the herd.

Corridor - An area through which species can move from one place to another over time in response to changes in environment or as natural parts of their history..

Cost - The negative or adverse effects of expenditures resulting from an action. Costs may be monetary, social, physical, or environmental in nature.

Cover - Vegetation used by wildlife for protection from predators, or to ameliorate conditions of weather, or in which to reproduce.

Cultural Resources - The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, lithic scatters, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation.

Cumulative Effect - The impact on the environment which results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period of time.

Degradation of water - A change in water quality that lowers the quality of high-quality waters for a parameter. Reductions in mean monthly streamflow in excess of 15 percent are also considered to be degradation. Changes in water quality that are considered not to be significant are established by the Montana Department of Environmental Quality.

Detection limit - The minimum concentration of a substance that can be identified, measured and reported with 99 percent confidence that the concentration is greater than zero.

Dispersed Recreation - That portion of outdoor recreation use which occurs outside of developed sites in the unroaded and roaded Forest environment, (*i.e.* hunting, backpacking and berry picking).

Displacement - As applied to wildlife, forced shifts in the patterns of wildlife use, either in location or timing of use.

Dissolved metals - Metals that are in solution and metals that are attached to very small floating particles.

Distance zones - The distance between a viewer and what is being viewed. Distance zones are typically described as foreground, middleground, or background.

Foreground - 0.25 to 0.5 miles (individual boughs of trees form textures)

Middleground - 0.5 to 3 to 5 miles (masses of trees form textures)

Background - 3 to 5 miles to the horizon line (tree stands appear uniform and texture cannot be discerned)

Diversity - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

Diversity - (Alpha, Beta, Gamma) - Reed Noss (1983) discusses three scales of diversity; alpha, beta, and gamma. Alpha diversity deals the number of species within a single habitat or community. Beta diversity addresses the change of species along a series of habitats. Gamma diversity is the species diversity of a large geographic region.

Employment-direct - The total number of employees or contractors employed for construction and operation of a project or projects.

Employment-indirect - The employment created by the additional demand for goods and services resulting from the project and its immigrating population.

Endangered Species Act - A federal act to provide protection and conservation for threatened or endangered species.

Eocene - The second of the five major epochs of the Cenozoic era, characterized by the rise of mammals.

Ephemeral Stream - A stream that flows only in direct response to precipitation and whose channel is at all times above the water table.

Exotic Species - Species which occur in a given place, area, or region as the result of direct or indirect, deliberate or accidental introduction of the species by humans, and for which introduction has permitted the species to cross a natural barrier to dispersal.

Erodibility - A rating of the relative susceptibility of exposed soil to erosion by water or wind.

Existing visual condition - The level or amount of modification from a naturally-appearing landscape.

Existing visual character - A general description of a visual environment in terms of landform, rock formations, water forms, and vegetative patterns often described in terms of line, form, color, and texture relative to the surrounding landscape.

Fault - A fracture along which there has been displacement of the sides relative to one another.

Fen - A peat wetland that is fed by ground water.

Poor fen - A peat wetland that receives ground-water flow and achieves productivity intermediate between that of a rich fen and ar ombotrophic bog.

Rich fen - A highly productive peat wetland often dominated by grasses or trees in contrast with shrubs and mosses.

Ferricrete - Deposits of sand and gravel cemented into a hard mass by iron oxide.

Fine sediment - Particles carried in the water and deposited on lake and stream bottoms that are less than 6.3 millimeters (mm) in diameter and, when present in excess, can cause marked degradation of aquatic habitats.

Floodplain - Level area near a stream or river, constructed by a river in its present climate and overflowed during moderate flow events, usually defined as a 100-year recurrence interval flood.

Forage - All browse and nonwoody plants available to livestock or wildlife for feed.

Forb - Herbaceous plant that is not a grass or grass-like, which usually has showy flowers, such as dandelion.

Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) - The parent act that preceded Forest Planning. This act directed that the National Forest System begin systematic resource planning on the National Forest units.

Forested Areas - Areas having at least 10 percent of the stand covered by trees, and those trees having at least 10 percent crown coverage.

Forest habitat type - The classification of vegetation types used to group forest vegetation by dominant species and basic ecological subdivisions (overstory, herbaceous and shrub undergrowth). All land areas potentially capable of producing similar plant communities at climax may be classified as the same habitat type. A climax habitat will develop on a site if not disturbed by fire, logging or other major disturbance.

Forest Plan standard - A criterion set by the Forest Service to meet resource goals; for example, a 30 percent old growth standard for certain management areas.

Fracture - A crack, joint, fault or other break in rocks.

Fragmentation - Breaking up of contiguous areas into progressively smaller patches of increasing degrees of isolation. \6. Opposite of connectivity.

Game Species - Any species of wildlife or fish for which seasons and bag limits have been prescribed under State or Federal Laws, Codes and Regulations, and which are normally harvested by hunting, trapping, and fishing.

Geology - The study of the planet Earth. It is concerned with the origin of the planet, the material and morphology of the Earth, and its history and the processes that acted (and act)

Glacial moraine - A mound, ridge, or other distinct accumulation of unsorted, unstratified glacial drift.

Glacial till - Unstratified glacial material deposited directly by a glacier without reworking by meltwater and consisting of a mixture of clay, silt, sand, gravel, and boulders.

Glaciofluvial - Pertaining to meltwater streams flowing from glaciers or to the deposits made by such streams.

Greater Yellowstone Area - Contiguous mountainous area including and surrounding Yellowstone National Park. Because of the confusing terminology and the fact that social and economic needs of people are also important issues, land managers use the term area instead of ecosystem when referring to this region. It is a more appropriate geopolitical definition and recognizes the inexact nature of the boundaries of this special and controversial place.

Grizzly Bear Core Area - An area where no motorized use of roads and trails occurs druing the non-denning period, and restricted roads require closure devices that are permanent; no roads or trails exist that receive non-motorized, high intensity use as defined in established cumulative effects activity definitions; and a minimus of 0.3 miles (500 m) exists from any open road or motorized trail.

Grizzly Bear, Habituated - A condition of grizzlies who consistently and aggressively pursue and depend upon food materials (human food, garbage, prepared livestock and pet foods, carrion, livestock, game meat) associated with man or his activities. Such individuals usually have no fear of man and are docile in man's presence until incited.
Source: USDI Forest Service, and USDI National Park Service. December 1979. Guidelines for management involving grizzly bears in the greater Yellowstone area. 136 pp. (see glossary P. 65).

Grizzly Bear Management Situation - Habitat for the grizzly bear is divided into five Management Situation categories based on grizzly habitat value and population distribution . If changes in grizzly population and distribution occur, restratification of these categories may become necessary. Habitat suitability combined with consistent grizzly distribution trends would be the basis for restratification. Population and habitat conditions of each

Management Situation are described (GYE Grizzly Bear Guidelines, 1979) below:

> Management Situation - The area contains grizzly populations centers (areas key to the survival of grizzlies where seasonal or yearlong grizzly activity, under natural, free-ranging conditions is common) and habitat components needed for the survival and recovery of the species or segment of its population. The probability is very great that major Federal activities or programs may effect (have direct or indirect relationships to the conservation and recovery of) the species.
>
> Management Situation 2 - The area lacks distinct grizzly population centers; highly suitable habitat does not generally occur, although some grizzly habitat components exist and grizzlies may be present occasionally. By definition, management situation 2 areas are those considered unnecessary for species survival and recovery, although the status of such areas is subject to review and change according to demonstrated grizzly population and habitat needs. The effects of major Federal activities or programs on the conservation and recovery of the species are not generally predictable.
>
> Management Situation 3 - Grizzly presence is possible but infrequent. Developments, such as campground, resorts, or other high human use associated facilities, and human presence result in conditions Which make grizzly presence untenable for humans and/or grizzlies. There is a high probability that major Federal activities or programs may affect the species conservation and recovery.
>
> Management Situation 4 - Grizzlies do not occur in the areas but habitat and human conditions make the areas potentially suitable for grizzly occupancy, and the area is needed for the survival and recovery of the species. The probability is very great that Federal activities and programs may affect the species conservation and recovery. .
>
> Management Situation 5 - Grizzlies do not occur or occur but rarely in the area. Habitat may be unsuitable, unavailable, or suitable and available but unoccupied. The area lacks survival and recovery values for the species or said values are unknown. Major Federal activities and programs probably will not affect species conservation and recovery.
>
> Source: USDA Forest Service, September 1984. Grizzly bear standards and guidelines for the Gallatin National Forest, Bozeman, MT.

Grizzly Bear Population Sink - An area that brings grizzly bears into contact with humans often resulting in removal of bears from the population.

Grizzly-Human Conflict Situation - A confrontation between man and/or his property and bear(s) in which the safety of man and/or bear(s) is jeopardized and/or property loss occurs. Source: USDI Forest Service, and USDI National Park Service. December 1979. Guidelines for management involving grizzly bears in the greater Yellowstone area. 136 pp. (see glossary P. 65).

Ground water - Subsurface water in a zone of saturation which is or can be brought to ground surface through springs, seeps, wells or direct discharge to surface flows.

Habitat - A place where a plant or animal naturally or normally lives and grows.

Habitat coefficients - Seasonal values ranking vegetation habitat features on the availability of food and/or cover.

Habitat Indicator Species - Species whose population changes are believed to indicate effects of management on other species of a major biological community or on water quality. The forest will provide for the maintenance and improvement of habitats for these indicator species.

Habitat type - An aggregation of all land areas potentially capable of producing similar plant communities.

Habituated - See Grizzly Bear, Habituated

Hardness - A property of water due primarily to the presence of calcium and magnesium ions. Aquatic life standards for some metals vary with changes in hardness.

Herbaceous vegetation - Seed producing plants, such as grasses, forbs and sedges, that do not develop persistent woody tissue.

Hiding Cover - Trees or other vegetation of sufficient size and density to conceal animals from view at 300 feet.

Historic - The period after Euroamerican influences entered the study area.

Historic district - A geographic area with a number of related significant historic properties.

Human disturbance zone - An area surrounding human activities in which habitat use by grizzly bears is reduced.

Human disturbance coefficients - Values assigned to different activity types and activity duration indicating the degree to which habitat within the zone of influence remains effectively usable by bears.

Igneous - A rock or mineral that solidified from molten or partially molten material, such as magma.

Income-direct - Income earned by direct employees.

Income-indirect - Income earned by indirect employees.

Income-non-earned - Retirement income, transfer payments and investment income.

Indicator Species - In the Forest Plan, a species of animal or plant whose presence is a fairly certain indication of a particular set of environmental conditions. Indicator species serve to show the effects of development actions on the environment.

Indigenous Species - A species which originally inhabitated a particular National Forest or National Grassland (see definition of exotic).

Indirect Effects - Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Infrastructure - The basic facilities and system on which a community depends such as roads, schools, sewer and water systems, and public buildings.

Inferred reserve base - The in-place part of an identified resource from which inferred reserves are estimated. Quantitative estimates are based largely on knowledge of geologic character of a deposit, and for which there may be no samples or measurements. The estimates are based on an assumed continuity beyond the reserve base.

Inmigrants - Employees or contractors and their families who move into the study area to take jobs.

Interior Habitat - That portion of an ecosystem or a fragment that is far enough removed from its outside boundaries so as not to be significantly influenced by edge effects. The width of the zone effected by the edge, and accordingly, the core of the interior habitat, will vary with the composition and structure of the ecosystem and the requirements of the species being considered. Species that require specific attributes of interior habitats are often referred to as interior species.

Intensive inventory or Survey - A pedestrian survey of 100 percent of an area to be impacted by a proposed undertaking. The goal of the inventory is to identify and evaluate all prehistoric and historic sites in the study area.

Intermittent Stream - A stream that flows only a certain times of the year when it receives water from springs or from some surface source such as melting snow.

Interdisciplinary Team (ID Team) - A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view to bear on the problem.

Intrusive - Igneous rock that is forced into pre-existing rocks while still in a liquid state (magma).

Issue - A point of discussion, debate, or dispute about environmental effects.

Isolated find - Location of a few (less than 5) historic or prehistoric artifacts.

Joint - Surface of fracture or parting in a rock, without displacement.

Key observation points - For analytical purposes, key viewing locations used to determine the visibility of features or objects.

Lacustrine - Any wetland situated in a topographic depression lacking trees, shrubs, persistent emergents, emergent masses or lichens with greater than 30% aerial coverage.

Laramide - A time of mountain building in the eastern Rocky Mountains, extending from the late Cretaceous through the Paleocene. Intrusive rocks and accompanying ore deposits were emplaced at that time.

Lead agencies - Agencies having the responsibility for preparing an EIS. The U.S. Forest Service and the Bureau of Land Management are the lead agencies for the proposed Cooke City Area Mineral Withdrawal EIS.

Load or loading - The total weight of a compound that a stream transports over a given time period. Loading is determined by multiplying flow by concentration.

Local hires - Employees or contractors associated with a project who already reside in the study area when hired.

MPDES Permit - Montana Pollution Discharge Elimination System Permit for point (usually a pipe) discharge to a stream, lake, or groundwater. Administered by the Montana Department of Environmental Quality - Water Protection Bureau.

Magnitude of physical change - A relative qualitative or quantitative measure of the amount or size of visual alteration.

Management area - Areas of National Forest System lands that have common management direction and which may not be contiguous in the forest.

Management Situation - See *Grizzly* Bear Management Situation.

Maximum modification - Human activity may dominate the characteristic landscape, but should appear as natural when viewed as background.

Metamorphic - Rock derived from pre-existing rocks by mineralogical, chemical and/or structural changes, essentially in the solid state, in response to changes in temperature, pressure, shearing stress, and chemical environment.

Mine Inflows - Ground water that flows into mine openings or mine portals.

Mineral entry - The filing of a mining claim on federal land to obtain the right to mine any locatable minerals it may contain. Also the filing for a mill site on federal land for the purpose of processing off-site locatable minerals.

Mineral exploration - The search for valuable minerals.

Mineralization - The process by which a mineral or minerals are introduced into a rock.

Mining related actions - Mining related actions would include: Prospecting, Exploration (access, drilling, geophysical exploration, trenching, pits, underground geophysical exploration, bulk sampling, Development (drilling, development shafts and adits, access, power, communications, mine and mill site preparation), Production (underground and surface methods, ore dressing, wastes, roads), and Reclamation. See USDA Forest Service General Technical Report INT-35 for a discussion of these actions.

Mitigation - Any method used to lessen the adverse effect of a proposed impact. Mitigation means avoiding actions or protecting resources where practical, but mitigation for significant historic and prehistoric sites can include data recovery through excavation, photography, archival research, re-analysis of existing collections, and oral interviews. Data recovery is intended to provide a record of the site and the information it contains even though the site would be subsequently destroyed or altered.

Modification - Human activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in middleground or background.

Morainal deposits - A mound or ridge of unstratified glacial materials deposited by direct glacial action.

National Forest Management Act - A law passed in 11976 as amendments to the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of Regional and Forest plans and preparation of regulations to guide that development.

National Forest System - Includes all National Forest System lands reserved or withdrawn from the public domain of the United States; all National Forest System lands acquired through purchase, exchange, donation, or other means; the national grasslands; and land utilization projects administered by the Forest Service under Title FCCCIII D of the Bankhead-Jones Farm Tenant Act of 1937.

National Register of Historic Places - A recorded list of significant cultural historic and prehistoric sites in the United States. The National Register of Historic Places (NRHP) was created by the National Historic Preservation Act. Sites listed on the NRHP are entitled to specified levels of protection from any undertaking that may damage the site.

Neotropical migrant - Migratory birds that have their winter habitat in southern latitudes (tropics) and their summer or breeding habitat in northern latitudes.

Nongame - Species of animals which are not managed as a sport hunting resource.

Noxious weeds - A legislated classification of undesirable plants that are of local concern due to their potential impacts such as reduced agricultural production and potential to displace native vegetation. Noxious weeds are generally not native to the local area.

Nutrient - Total inorganic phosphorus and total inorganic nitrogen.

OHV - Off-highway vehicles (4x4 high clearance vehicles, snowmobiles, ATVs, motorcycles).

Old growth forest - Individual trees or stands of trees that are past full maturity and showing a high degree of decadence. Old growth forests are considered ecosystems that are distinguished by old trees and related structural attributes. They encompass the later stages of stand develop-

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ment that typically differ from earlier stages in characteristics such as tree age, tree size, number of large trees per acre and basal area. In addition, attributes such as decadence, dead trees, the number of canopy layers and canopy gaps are important but more difficult to define.

pH - A numerical measure of reactivity of hydrogen ions in soil or water. A neutral pH is 7.0; pH values greater than 7.0 are alkaline and values below 7 are acid.

PM10 - Particulate matter less than 10 microns in diameter.

PSD - Prevention of Significant Deterioration permit administered by the Montana Department of Environmental Quality - Air and Waste Management Bureau. PSD permits are required for new sources of air pollution in order to restrict emissions to specified increments where air quality is already better than required to meet primary and secondary ambient air quality standards.

Paleozoic - The earliest Era of geologic time. Characterized by the appearance of marine invertebrates, primitive fishes, primitive land reptiles, and land plants. Ranged from 570 million years to 225 million years ago.

Palustrine - Non-tidal wetland of a class dominated by trees, shrubs, persistent emergents, or emergent mosses or lichens.

Partial Retention - Human activities may be evident, but most remain subordinate to the characteristic landscape.

Patented mining claim - A former unpatented claim to which the U.S. has issued a document conveying ownership and title of both surface and mineral estates to a private party.

Perennial Stream - A stream that flows continuously year round.

Periphyton - Communities of soft-bodied algae and diatoms that live in benthic environments.

Permeability - The property of porous rock, soil or sediment for transmitting water; a measure of the relative ease of fluid flow under unequal pressure.

Phanerozoic - That part of geologic time represented by rocks in which the evidence of life is abundant.

Pleistocene - The geologic epoch characterized by the alternate appearance and recession of glaciation, the "Ice Age".

Population - A group of individuals of any one kind of organism living and interacting over a given area.

Population inmigration - All the sum of inmigrating employees (direct and indirect), as well as their spouses and children of these employees.

Population Sink - See Grizzly Bear Population Sink

Precambrian - The oldest and largest division of geologic time. Representing all geologic time before the paleozoic.

Prehistoric - Refers to the Native American past in the study area before Euroamerican influences entered the area.

Preservation - A visual quality objective.

Project Area - See Study Area

Raptor - Birds of prey, such as owls, hawks, and eagles.

Recharge - The addition of surface water to ground water, such as by precipitation or leakage from streams.

Reclamation - The restoration of surface conditions to prevent erosion and/or promote revegetation of the disturbed area.

Recreation opportunity spectrum - ROS - A framework describing, stratifying, and defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences are arranged along a continuum or spectrum divided into six classes; primitive, semi-primitive, roaded-natural appearing, rural and urban.

Rehabilitation - A management objective to restore undesirable visual impacts to the greatest degree possible. Rehabilitation may be achieved through the alteration, concealment, or removal of obtrusive elements.

Relative habitat value - A numerical ranking used in this EIS analysis for assessing the relative effects of each alternative on grizzly bear habitat. Habitat (food and cover) coefficients and human disturbance coefficients were used to calculate relative habitat values.

Reserves - For this EIS, the portion of an identified mineral resource base that meets specified minimum physical and chemical criteria related to current mining and production practices and that can be economically and legally extracted at the time of determination. Quantity is computed from dimensions revealed in rock outcrops, trenches, workings, or drill holes; quality or grade is computed from results of detailed sampling.

Retention - Human activities are not evident to the casual Forest visitor.

Revegetation - The successful establishment of a permanent, self-sustaining stand of vegetation.

Riffle and pool complexes - Riffles are the rapid movement of water over a coarse substrate (rocks) resulting in rough flow, turbulent surface and high dissolved - oxygen levels in the water. Pools are deeper areas associated with riffles (40 CFR 230.45). Pools have slower velocities, a smooth surface and finer substrates.

Riparian areas - Areas with distinctive resource values and characteristics that are comprised of an aquatic ecosystem and adjacent upland areas. This includes floodplains, wetlands, and all areas within a horizontal distance of about 100 feet from the normal high-water line of a stream channel, or from the shoreline of a standing body of water.

Riparian Ecosystem - a) Ecosystems transitional between terrestrial and aquatic ecosystems. Also streams, lakes, wet areas and adjacent vegetation communities and their associated soils which have free water at or near the surface. b) Those assemblages of plants, animals, and aquatic communities whose presence can either be directly or indirectly attributed to factors that are water influenced or related. Interacting system between aquatic and terrestrial situations, identified by soil characteristics, and distinctive vegetation that requires or tolerates free or unbound water.

Riparian Vegetation - Plant species that grow adjacent to streams or other bodies of water, or that require additional moisture to survive and are located in areas with run-in moisture or perched water tables.

Riparian Zone - An area of vegetation adjacent to an aquatic ecosystem. It has a high water table, certain soil characteristics, and some vegetation that requires free (unbound chemically) water or conditions that are more moist than normal. This zone is transitional between aquatic and upland zones.

Roadless Area attributes - Characteristics of a Roadless Area, similar to wilderness characteristics. The Forest Service has established six attributes that are considered in analyzing effects to Roadless Areas–natural integrity; apparent naturalness; remoteness; solitude; special features; and manageability and boundaries.

> Natural integrity, apparent naturalness and solitude have the same meaning as wilderness attributes.
>
> Remoteness is a perceived condition of being secluded, inaccessible, and out of the way.
>
> Special features are those unique geological, biological, ecological, cultural or scenic features that may be located in a Roadless Area.

Manageability and Boundaries relates to the ability of the Forest Service to manage a Roadless Area to meet size criteria (generally greater than 5,000 acres) and the other five attributes.

Runoff - Water that flows over the soil surface from areas that are impervious, locally saturated, or areas where the rainfall rate exceeds the infiltration capacity of the soil.

Scenic Integriy - State of naturalness, or conversely, the state of disturbance created by human activities or alteration. Integrity is stated in degrees of deviation from the existing landscape character in a national forest.

Scoping - The process of explaining the proposed action, identifying issues related to the proposed mineral withdrawal, and reasonable alternatives that are to be analyzed in depth in an Environmental Impact Statement

Sedimentary - Rocks formed by the deposition and consolidation of sediment.

Sedimentation - The process of deposition of clay, sand, gravel and/or organic fragments that have been transported by water or wind.

Sediment yield - The increased deposition, in tons per year, of solid fragmental material into area streams due to increased soil erosion.

Seismic - Of or pertaining to earthquakes.

Sensitive species - Those plant or animal species which are susceptible or vulnerable to activity impacts or habitat alterations and will be managed similar to threatened or endangered species. The Forest Service policy is to ensure that species would not be affected in such a manner as to have them listed or proposed for listing as threatened or endangered.

Seral stage - Series of transformations from one vegetation community to the next.

Significant cultural resources - Prehistoric and historic sites that have been evaluated as eligible for nomination to the NRHP.

Site, cultural - Location of structures, features (such as, but not limited to, archeological pits, hearth, and walls), and historic and/or prehistoric artifacts.

Special aquatic sites - Sanctuaries and refuges, mud flats, vegetated shallows, coral reefs, pool and riffle complexes and wetlands (40 CFR 230.45).

Species - A population or series of populations of organisms that are capable of interbreeding freely with each other but not with members of other species.

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Split Estate - A term that refers to different ownership of the surface and subsurface properties. For example, the Federal government may own the surface and a private person or persons may own the minerals underlying the parcel.

Soil association - A soil mapping unit in which two or more defined soil taxonomic units occur together in an individual and characteristic pattern over a geologic region.

Soil complex - A mapping unit used in soil surveys where two or more defined taxonomic units are so intimately intermixed geographically that it is impractical to separate them.

Soil survey - A general term for the systematic examination of soils in the field and laboratory. Soil surveys provide a description and classification of map units, as well as interpretations for various uses or management.

Soil taxonomic name - A classification of soils based on their characteristics. Taxonomic names are similar to scientific names used for biological classification of plants and animals.

Stock - A body of intrusive igneous rock less than 40 square miles in surface exposure.

Stormwater Discharge Permit - Permit required for nonpoint discharges of sediment and other pollutants by controlling source sites affected by infrequent storm discharge. Administered by the Montana Department of Environmental Quality - Water Quality Division and includes construction projects that will disturb more than 5 acres, more than 1 acre if the site is within 100 feet of a stream.

Stratovolcano - A conical-shaped volcano composed of ash and lava deposited in alternating layers.

Study Area - Area of analysis for proposed mineral withdrawal on the Gallatin and Custer National Forest.

Subsoil - The subsurface layers of mineral soil with varying degrees of organic matter accumulation, textural differences (i.e., clay accumulation) and other properties developed as a result of the soil formation process. These subsoil layers are identified as a resource to aid in the reclamation process if soil disturbance must occur. They can be used as part of the growth medium as well as providing distinct engineering properties to aid in drainage or limiting seepage and infiltration of water, etc.

Suitable forest land - Forest land (as defined in CFR 219.3) for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions; for which there must be reasonable assurance that such lands can be adequately restocked (as provided in CFR 219.14); for which there is management direction that indicates timber production is an appropriated use of the area.

Tailings - Ground-up rock from which marketable minerals have been removed by milling.

- Pyrite - A naturally-occurring mineral (iron disulfide) with a bright metallic luster. Called "fools gold." Can produce sulfuric acid over time when exposed to air and water. Pyritic tailings refers to tailings containing pyrite and other minerals.

- Dewatered tailings-Tailings from which some water has been removed. Dewatered tailings would have about 20 percent moisture, similar to moist clay.

Talus - Fragments of rock and other soil material.

Terrestrial Ecosystem - A land based ecosystem. An interacting system of soil, geology, topography with plant and animal communities.

Tertiary - The first period of the Cenozoic Era. Characterized by the appearance of modern flora and large mammals. From 65 million to 2 million years ago.

Threatened, Endangered and Sensitive Species (TES) - Any species, plant or animal, which is likely to become a threatened or endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.

Timber compartments - Areas within the Forest established to manage the land and resources.

Total Dissolved Solids - TDS - Summation of anions and cations dissolved in water.

Total recoverable metals - That portion of a water and suspended sediment sample measured by the total recoverable analytical procedure described by the U.S. EPA in "Methods for Chemical Analysis of Water and Wastes," 1979.

Traditional cultural properties - Properties that play a role in living or modern communities historically rooted beliefs, customs, and practices.

Topsoil or native surface soil - The surface layers of organic matter accumulation and mineral soil found in soil profiles resulting from the soil formation process. The surface layer is often a valuable resource to aid in the reclamation process especially if it can be handled as a separate layer and replaced on top of a reclaimed surface. Topsoil replacement has become a standard operating procedure for most soil disturbing activities including highways, mining and general construction.

Unpatented mining claim - A geographic area of public lands in which an individual, by the act of valid location under the mining laws, has obtained a right to remove and extract minerals from the land, but where full title has not been acquired from the U.S. Government. The maximum size of a lode claim is 600 x 1500 feet (approximately 20 acres) and the maximum size of a placer claim is 20 acres.

Valid Existing Rights - Mining claims have valid existing rights if a discovery was made on the claim prior to the date of withdrawal from mineral entry. "A mining claimant must make a discovery of a valuable mineral deposit within the limits of a mining claim as a prerequisite to a valid location. A discovery exists where minerals have been found on the claim which are of such a character that a person of ordinary prudence would be justified in further expenditure of his labor and means with a reasonable prospect of success in developing a valuable mine. This prudent person test has been refined to require a claimant to show that the mineral is "marketable", that is, that it can be extracted, removed, and marketed at a profit.

Variety class - A particular level of visual variety or diversity of landscape character.

Vegetation types - Existing plant communities with distinguishing characteristics, typically dominated by one or two species, which are used to name the vegetation type.

Viability - The likelihood of continued existence in an area for some specified period of time.

Viewer sensitivity - The degree or measure of viewer interest in the scenic qualities of a landscape. Viewer sensitivity is often closely associated with the level of visual expectation of the viewer.

Visibility - The level or measurement of the ability to see a feature from a particular view point or view points. Usually measured in distance called Standard Visual Range.

Visual absorption capability - The ability of a landscape to absorb change without being visually evident. Key determinants are typically landform and vegetative diversity, the viewing angle, and slope.

Visual quality - A qualitative term used to indicate the relative attractiveness of a visual resource.

Visual quality objectives - A desired level of scenic quality based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration of a characteristic landscape. Commonly referred to as VQO.

Watch Species - A plant species, or recognized subspecies or variety which meets the above definition of a sensitive species, but is not presently known to occur on National Forest land in North Dakota. These taxa, are predicted to occur on National Forest land on the basis of suitable habitat. If found on National Forest land, these taxa would immediately be evaluated for placement on the sensitive species plant list.

Water right claim - A claim to use a certain quantity of water for beneficial uses which has not been judicially established as a water right.

Water right - The right to use a certain quantity of water for beneficial purposes.

Watershed - The entire land area that contributes water to a particular drainage system or stream.

Waters of the U.S. - All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide, all interstate waters including interstate wetlands; all other waters, such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which would or could affect interstate or foreign commerce; all impoundments of waters otherwise defined as waters of the United States, tributaries of waters; the territorial sea; and wetlands adjacent to waters [defined above] (33 CFR 328.3). Waters of the U.S. within the project area include springs, seeps and ephemeral drainages, small perennial drainages commonly supported by ground water seeps, large perennial drainages with pool and riffle complexes, small unnamed ponds, and jurisdictional wetlands.

Water Table - The surface of a body of unconfined groundwater.

Wetland functions - Physical, chemical or biological processes or attributes of wetlands that are vital to the integrity of the wetland system.

Wetlands - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. (33 CFR 328.3). Jurisdictional wetlands are based on the guidelines and criteria set forth in the Corps of Engineers Wetland Delineation Manual (Environmental Laboratories, 1987). Wetlands are found throughout the project area, and are considered special aquatic sites.

Wilderness attributes-Characteristics of designated and recommended Wilderness. The Wilderness Act directs land managing agencies (the U.S. Forest Service) to protect the natural character of the wilderness and to provide for recreational, scenic, scientific, educational, cultural, and historical uses of wilderness areas. Based on the Wilderness Act's definition of wilderness, the Forest Service describes four requisite attributes of Wilderness-natural integrity; apparent naturalness; outstanding opportunities for solitude; and opportunities for primitive recreation. These attributes are applied to the conditions inside the boundaries of the Wilderness.

Natural integrity is the extent to which long-term ecological processes are intact and operating.

Apparent naturalness is a measure of importance of visitors' perceptions of human impacts to an area.

Solitude is a personal, subjective value defined as isolation from the sights, sound and presence of others, and of the development of man.

Opportunity for primitive recreation includes the opportunity to experience solitude, a sense of remoteness, closeness to nature, serenity, and spirit of adventure.

Wild River - A river segment that has been designated by the U.S. Congress for inclusion into the Wild and Scenic River System because it has characteristics of a wild river. A portion of the Clarks Fork Yellowstone River in Wyoming is a designated Wild River. Wild rivers have four characteristics - free of impoundments; generally inaccessible except by trails; watersheds or shoreline essentially primitive; and waters unpolluted.

Designated river segment - A river segment that has been designated by the U.S. Congress or the Secretary of the Interior as a wild, scenic, or recreational river because of its outstandingly remarkable values.

Eligible river segment - A river or creek segment that has been determined by a land-managing agency, such as the Forest Service, to be free-flowing and possessing at least one outstandingly remarkable value. Several river segments in the withdrawal area are eligible river segments.

Outstandingly remarkable values - Values associated with designated or eligible Wild and Scenic River segments. The Wild and Scenic River Act describes six outstanding remarkable values that Wild and Scenic Rivers may possess - scenic, recreational, geological, fish and wildlife, historical, and cultural.

REFERENCES

Alward, Gregory. Shannon Weaver Economic Diversity Index. USDA Forest Service, Land Management Planning Systems, Fort Collins, Colorado. 1995.

Amendments to Proposed Withdrawal; Montana. Federal Register. September 20, 1996.

Anderson, R.J. *Draft Water Resources Management Plan for Yellowstone National Park*, University of California, Los Angeles, 1993, 213 pp.

Barbee, Robert D. Memo to Regional Director, Rocky Mountain Region-NPS. November 15, 1990.

Beckes, Michael R. and James D. Keyser. *The Prehistory of the Custer National Forest: An Overview*, Custer N.F., Billings. 1983.

Beckley, Paul R. "Measuring Intra-Annual Unemployment Rate Variation Based on a 20 Year History for the Counties of Montana," *Land Management Technical Notes*, Note No. 6, Flathead National Forest, Kalispell, May 1995. 7pp.

Beckley, Paul R. "Measuring Per Capita Personal Income Growth Rate Variance: A Potential Variable for Economic Stability Indices Using a 24-Year History of the Counties of Montana As An Example," *Land Management Technical Notes*, Note No. 5, Flathead National Forest, Kalispell, February 1995. 7pp.

Beckley, Paul R. "Measuring Population Growth Rate Variance: A 24 Year History for the Counties of Montana," *Land Management Technical Notes*, Note No. 4, Flathead National Forest, Kalispell, January 1995. 7pp.

Bromley, M. *Wildlife Management Implications of Petroleum Exploration and Development in Wildland Environments*, USDA Forest Service, Intermountain Research Station, Ogden, UT. General Technical Report INT-191, 1985. 42 pp.

Cannon, Kenneth P. "A Model for Prehistoric Economies of the Yellowstone Plateau During the Altithermal," *Ecological Implications of Fire in Greater Yellowstone*, IAWF, 1996.

Chamberlain, C.P. 1997, The History and Controls of Metal Deposition in the Clarks Fork of the Yellowstone River and Its Tributaries". Dept. of Earth Sciences, Dartmouth College, Hanover, NH. 6 pp.

Chapman, D.W. "Critical Review of Variables Used to Define Effects of Fines in Redds of Large Salmonids," *Transactions of the American Fisheries Society*, 1988. 117:1-21.

Chittenden, Hiral Martin. *The Yellowstone National Park*, Univ. of Oklahoma Press, Norman, 1964.

Clements, W.H., and P.M. Kiffney. "The Influence of Elevation on Benthic Community Response to Heavy Metals in Rocky Mountain Streams," *Canadian Journal of Fisheries and Aquatic Sciences*, 1995. 52-1966-1971.

Clements, W.H. "Benthic Invertebrate Community Responses to Heavy Metals in the Upper Arkansas River Basin, Colorado," *Journal of the North American Benthological Society*, 1994. 13:30:44.

Code of Federal Regulations. Title 36, Part 73-World Heritage Convention.

Corkran, Rob. *An Economic Profile of Cooke City and Silver Gate Montana: Communities Facing Transition*, Denver, Colorado, 1993.

Cowardin, L.C., V. Carter, and E.T. LaRoe. *Classification of Wetlands and Deepwater Habitats of the United States*, FWS/OBS-79/31. Washington D.C., 1979, 103pp.

Cox, D.P. *Descriptive Model of Polymetallic Veins*, USGS Bull, 1986. 1693.

Crown Butte Mines, Inc. Application for a Hard Rock Operating Permit and Proposed Plan of Operation, New World Project, Park County, Montana. Submitted to the U.S. Forest Service and the Montana Department of State Lands. 1990; revised 1992.

Crown Butte Mines, Inc. Application for a Permit to Construct and Operate a Precious Metals Mine, Mill and Tailings Disposal Facility at the New World Project, Park County. Submitted to the Montana Department of Health and Environmental Sciences, 1994.

Davis, C.P., Letter from Charles P. Davis, Field Supervisor, Wyoming Field Office, USFWS to John Thompson, BLM, and Larry Timchak, USFS, Cooke City Area Mineral Withdrawal Team, Billings, MT regarding reply to request for a list of Federally listed endangered and threatened species, October 30, 1996, p. 1.

Decker-Hess, J., and R.G. White. *Instream Flow Requirements of Soda Butte Creek, Yellowstone National Park*, Report, Montana State University, Montana Cooperative Fishery Research Unit, Bozeman, MT, 1987.

Douglas, C.W., and M.A. Strickland. 1987. Chapter 40. Fisher. pp. 510-529. In: Novak, M., J.A. Baker, M.E. Obbard, and B. Mallock. 1987. Wild furbearer management and conservation in North America. Ministry of Natural Resources at Whitney Block, Queen's Park, Toronto, Ontario, Canada, M7A 1W1, 150 pp.

Eberhardt, L.L., and R.R. Knight, 1996. How many grizzlies in Yellowstone? J. Wildl. Manage. 60(2):416-421.

Elliott, J.E., Kirk, A.R. and Johnson, T.W. "Field Guide, Gold-Copper-Silver Deposits of the New World District," *Northwest Geology*, Vol. 20/21, Guidebook for the Red Lodge- Beartooth Mountains, Stillwater Area, Tobacco Root Geological Society 17th Annual Field Conference, 1992.

Ferguson, David M. National Register of Historic Places Multiple Property Documentation Form for the New World Mining District, Park Co., Montana. GCM Services, Inc., Butte, 1994a.

Ferguson, David M. National Register of Historic Places Registration Form for the New World Mining District, Park Co., Montana. GCM Services, Butte, 1994b .

Ferguson, David M. NHPA Determination of Effect to Cultural Resources for the Proposed New World Mine. GCM Services Inc., Butte, 1996.

Fontaine, J., Phone record of communication by telephone between Joe Fontane, USFWS, Helena, MT and Don Sasse, USFS, Custer National Forest, regarding gray wolf in proximity of the Cooke City Area Proposed Mineral Withdrawal Area, October 28, 1996, p. 1.

"Forest Landscape Management," Volume 2. Chapter 1, *The Visual Resource Management* System. Agricultural Handbook Number 462, Washington, DC.

Fournier, R.O. "Geochemistry and Dynamics of the Yellowstone National Park Hydrothermal System," Ann. Rev. *Earth Planet Science* 17:13-53, 1989.

Frison, George. *Prehistoric Hunters of the High Plains*, Academic Press, New York, 1978.

Furniss, G. "Age Relationships of Acid Drainage Water Quality at the New World Mining District, Park County, Montana," Ballard, D., ed., *Expanded Abstracts Volume, American Association of Petroleum Geologists/ Rocky Mountain Section*, July, 1996

Furniss, G., University of Montana. *Relationship of Acid Drainage Water at the New World Mine District, Park County, Montana*, Missoula, Montana, 1996.

Garten, E.O., B. Crabtree, B. Ackerman, and G. Wright. "The Potential Effect of a Reintroduced Wolf Population on the Northern Yellowstone Elk Herd," *Third Annual Meeting, Research and Monitoring on Yellowstone's Northern Range*, National Park Service, Yellowstone National Park, 1990. 23 pp.

GCM Services, Inc. *Cultural Resources Inventory and Assessment, the New World Mining Project, Park County, Montana*, GCM Services, Inc., Butte, 1990.

Glidden, Ralph. *Exploring the Yellowstone High Country: A History of the Cooke City Area*, Artcraft Printers, Bozeman, 1976.

Gold Fields Mineral Services, Ltd., 1994, Gold 1994. On file with the United States Department of Agriculture, Forest Service.

Haines, Aubrey L. *A Preliminary Report on High Altitude Indian Occupation Sites Near the North Boundary of Yellowstone National Park*, Report to the National Park Service. Yellowstone National Park, 1963.

Hansen, Virginia. *The Fabulous Past of Cooke City*, Billings Printing Co., Billings, 1962.

Hausle, D.A., and D.W. Coble. "Influence of Sand in Redds on Survival and Emergence of Brook Trout (*Salvelinus fontinalis*)," *Transactions of the American Fisheries Society*, 1976. Vol 1:57-63.

Hickman, T., and R.F. Raleigh. *Habitat Suitability Index Models: Cutthroat Trout*, FWS/OBS-82/10.5. Office of Biological Services, USDI Fish and Wildlife Service, Ft. Collins, CO, 1982.

Husted, Wilfred and Robert Edgar. *The Archaeology of Mummy Cave, Wyoming: An Introduction to Shoshone Prehistory*, Manuscript, 1969.

Husted, Wilfred. *The Beartooth Alpine Archaeology Project: Preliminary Observations and Suggestions for Future Research*, 50th Plains Anthropological Conference, Lincoln, Nebraska, 1992.

Hydrometrics, Inc. Raw water quality data for Crown Butte Mine, 1995.

Hynes, H.B.N. *The Ecology of Running Waters*, University of Toronto Press, Toronto, 1970.

Interagency Grizzly Bear Committee. *Interagency Grizzly Bear Committee Taskforce Report. Grizzly Bearimotorized Access Management*, Bozeman, MT, 1994.

Irving, J.S., and T.C. Bjornn. *Effects of Substrate Size Composition on Survival of Kokanee Salmon and Cutthroat and Rainbow Trout Embryos*, University of Idaho, Cooperative Fishery Research Unit, Technical Report 84-6, Moscow, 1984.

James, H. L. *The Beartooth Highway, Geologic and Historic Guide to the Beartooth Highway, Montana and Wyoming*, Special Publication 110, Montana Tech of the University of Montana, Butte, 1995.

Johnson, T.W. "Geology and Paragenesis of the Mclaren Copper-silver-gold Skarn and Replacement Deposit, New World District, Park County, Montana," *Northwest Geology*, Vol. 20/21, Tobacco Root Geological Society, 17th Annual Field Conference, 1992.

Jones, R.D., et al. *Fishery and Aquatic Management Program in Yellowstone National Park*, U.S. Fish and Wildlife Service, Technical Report for 1989, Yellowstone National Park, Wyoming, 1990.

Jones, R.D., et al. *Fishery and Aquatic Management Program in Yellowstone National Park*, U.S. Fish and Wildlife Service, Technical Report for 1992, Yellowstone National Park, Wyoming, 1993.

Jones, R.D., et al. *Fishery and Aquatic Management Program in Yellowstone National Park*, U.S. Fish and Wildlife Service, Technical Report for 1978, Yellowstone National Park, Wyoming, 1979.

Jones, R.D., et al. *Fishery and Aquatic Management Program in Yellowstone National Park*, U.S. Fish and Wildlife Service, Technical Report for 1981, Yellowstone National Park, Wyoming, 1982.

Judd, S.L., R. Knight, and B. Blanchard. *Denning of Grizzly Bears in the Yellowstone National Park Area*, Interagency Conference on Bear Research and Management, 1986. 4:359-367.

Kirk, A.R., Bedrock Structure and Hydrology: New World Project, Park County, MT, Submitted to the Montana Department of State Lands, 1995.

Knight, R.R., B.M. Blanchard, and L.L. Eberhardt. *Mortality Patterns and Population Sinks For Yellowstone Grizzly Bears*, 1973-1985. Wildlife Society Bulletin, 16:121-125, 1988.

Knight, R.R., D.J.Mattson, and B.M. Blanchard. *Movements and Habitat Use of the Yellowstone Grizzly Bear*, Interagency Grizzly Bear Study Team, Montana State University, Bozeman, MT, 1984. 177 p.

Koski, K.V. *The Survival and Fitness of Two Stocks of Chum Salmon (Oncorhynchus Keta) from Egg Deposition to Emergence in a Contrilled Stream Environment at Big Beef Creek*, Doctoral dissertation, University of Washington, Seattle. As cited in: Meehan, W.R., ed. *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats*, American Fisheries Society Special Publication 19, 1975. p.103.

Kulik, D.M., and Schmidt, C.J. "Region of Overlap and Styles of Interaction of Cordilleran Thrust Belt and Rocky Mountain Foreland," Schmidt, C.J., and Perry, W.J., Jr., eds., *Interaction of the Rocky Mountain Foreland and the Cordilleran Thrust Belt*: GSA Memoir 171, 1988. p. 75-98.

Litton, R. Burton, Jr., *Visual Vulnerability of th Landscape: Control of Visual Quality*. Research Paper WO-39, USDA Forest Service, Washington, DC, 1984.

Livingston Enterprises. *Livingston Enterprise Souvenir*, Reprint of March 17, 1990 issue. Reprinted in 1976, Enterprise Publishing Co., Park Co., MT, 1990.

Lovering, T.S. *The New World or Cooke City Mining District, Park County, Montana*, USGS Bulletin 811-A, 1929.

Lyden, C.J. *The Gold Placers of Montana*, MBMG Memoir # 26, 1948

Marshall, R.C., *Commodity Economic Report on Copper*, United States Department of Agriculture, Forest Service, Missoula, MT, 1993.

Mattson, D.J., B.M. Blanchard, and R.R. Knight. *Food Habits of Yellowstone Grizzly Bears*, 1977-87. Can. J. Zool, 1991. 69:1619-1629.

McMaster, K.M., Letter from Kemper, M. McMaster, Field Supervisor, Montana Field Office, USFWS to John Thompson, BLM, and Larry Timchak, USFS, Cooke City Area Proposed Mineral Withdrawal Team, Billings, MT regarding reply to request for a list of Federally listed endangered and threatened species, September 16, 1996, pp. 4.

Meagher, M. "Evaluation of Boundary Control for Bison of Yellowstone National Park," unpublished report, National Park Service, Wyoming, 1989. 13 pp.

Meagher, M. Sept. 12, 1994. (Unpublished) Bison in the Greater Yellowstone Area: Status, distribution, and management. (Draft: Presented at the National Brucellosis Symposium, Jackson Hole, WY, Sept. 1994. 20 pp. plus attachments.

Meyer, G. 1993. A Polluted Flash Flood and Its Consequences. Pages 2-6 in P. Schullery, ed. Yellowstone Science Volume 2, No.1.

Miller, Ann. "Mine Decision Troubles Local Industry," *Western Business*, Billings MT, September, 1996. pg1.

Montana Department of Commerce, Census and Economic Information Center. Published and unpublished data for various years. Helena, Montana.

Montana Department of Environmental Quality. *Preliminary Determination on Crown Butte Mines' Air Permit Application*, Helena, MT, 1995.

Montana Department of Health and Environmental Sciences. *Significance Determination for the New World Project.* March 26, 1995.

Montana Department of Health and Environmental Sciences. *The Montana 305(b) Report.* Montana Water Quality Division, June, 1994.

Montana Department of Labor and Industry. Published and unpublished data for various years. Helena, Montana.

Montana Department of State Lands. *Montana Forestry BMP's*, Montana Department of State Lands. Helena, Montana, 1991.

Montana Department of State Lands. *Montana Guide to the to the Streamside Management Zone Law and Rules.* Montana Department of State Lands. Helena, Montana. 1991.

Montana Department of Transportation. Letter to Mike DaSilva, Montana Department of State Lands, November 28, 1994, in the Transportation Technical Report.

Montana Water Court. "Master's Report: Case No. 43B-486, Objections in the Adjudication of Margaret Reeb's Water Rights," 1989.

Morhman, J., R. Ewing, and D. Carty. *Sources and Quantities of Suspended Sediment in the Yellowstone River and Selected Tributary Watersheds Between Yellowstone Lake Outlet, Yellowstone National Park, Wyoming, and Livingston, Montana: 1986 Annual Progress Report*, U.S. Fish and Wildlife Service, Yellowstone Fisheries Office, Aquatic Ecology Studies Technical Report Number 4. Yellowstone National Park, Wyoming, 1988.

Murtaugh, James. *Montana: Steady State In Transition*, Liz Claiborne and Art Ortenberg Foundation, Center for National Policy, Washington D.C. (202 546-9300), 1993.

Nimmo, D.W. Personal communication with Richard Trenholme regarding National Biological Service research in Soda Butte Creek, February 1996.

Notice of Intent to Prepare an Environmental Impact Statement; Notice of Public Meetings; Montana, Wyoming, Federal Register. September 27, 1996.

Notice of Proposed Withdrawal; Montana, Federal Register, September 1, 1995.

Notice of Intent to Prepare a National Environmental Policy Act (NEPA) Analysis; Notice of Public Meetings; Montana. Federal Register, May 31, 1995.

Peters, W.C., *Exploration and Mining Geology*, Second Edition, pp.537.

Pierce, Kenneth L. *Surficial geologic map of the Abiathar Peak and parts of adjacent quadrangles, Yellowstone National Park, Wyoming and Montana.* U.S. Geological Survey Misc. Investigations Map I-646. U.S. Geological Survey, Denver, Colorado, 1974.

Planning Information Corporation, "An Interim Report on the Potential Effects of the Proposed New World Mine on Socioeconomic Conditions in Park County, Wyoming," Denver, CO, March 5, 1997.

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross and R.M. Hughes. *Rapid Bioassessment Protocols for Use in Streams and Rivers. Benthic Macroinvertebrates and Fish, EPA/440/4-89/001.* Office of Water, U.S. Environmental Protection Agency, Washington, D.C. 1989.

Puckett, William. *Heritage Program Narrative*, USDA Forest Service, Rocky Mountain Region, 1983.

Raleigh, R.F. *Habitat Suitability Index Models: Brook Trout*, FWS/OBS-82/10.24, Office of Biological Services, USDI Fish and Wildlife Service, Ft. Collins, CO, 1982.

Reed, G.C. *Mines and Mineral Deposits (Except Fuels), Park County, Montana*. U.S. Bureau of Mines Information Circular 7546, 1950.

Robertson, F. *Geochemical Prospecting by Soil Analysis in Montana*, Montana Bureau of Mines and Geology Bulletin No. 7, 1956.

Rosgen, D.L. *A Classification of Natural Rivers*. Cantena, 1994. 22:169-199.

Sage, G.K., and R. Leary. *Genetic Analysis of Trout Populations In The Yellowstone, Gallatin, and Madison River Drainages, Montana. Population Genetics Laboratory Report 90/1*, University of Montana, Missoula, Montana, 1990.

Sasse, D., Nov. 29, 1996. Draft Wildlife Technical Report for Cooke City Area Mineral Withdrawal Preliminary Draft Environmental Impact Statement, Custer National Forest, USFS Northern Region, MT. Chap. III = 18 pp; Chap. IV = 37 pp.

Schuster, Ervin G., McGinnis, Wendy, and Walter L. Stewart. *Economic Indicator Maps for Rural Development in the Interior West*, USDA Forest Service, Intermountain Research Station, General Technical Report INT-GTR-330, January 1996.

Shovic, H., J. Mohrman, R. Ewing. *Major Erosive Lands in the Upper Yellowstone River Drainage Basin from Livingston, Montana to Yellowstone Lake Outlet, Yellowstone National Park*, Yellowstone Fisheries Office, Yellowstone National Park, WY. 1988.

Simons, F.S., et al. *Mineral Resources of the Beartooth Primitive Area and Vicinity, Carbon, Park, Stillwater and Sweet Grass Counties, Montana, and Park County, Wyoming*, USGS Bull 1391-F, 1979.

Singer, F. *Ungulate Population Models and Carrying Capacity*. Third Annual Meeting, Research and Monitoring on Yellowstone's Northern Range. National Park Service, Yellowstone National Park, 1990. pp. 15-21

Sowden, T.K., and G. Power. "Prediction of Rainbow Trout Embryo Survival in Relation to Groundwater Seepage and Particle Size of Spawning Substrates," *Transactions of the American Fisheries Society* 114:804-812. 1985.

Stowell, R. et al. *Guide for Predicting Salmonid Response to Sediment Yields in Idaho Batholith Watersheds*, U.S. Forest Service, Northern Region, Missoula, Montana, and Intermountain Region, Ogden, Utah. 1983.

Tennant, D.L. "Instream Flow Regimes for Fish, Wildlife, Recreation, and Related Environmental Resources," Pages 359-373 in J.F. Osborn and C.H. Allman, eds. *Instream Flow Needs, Vol.ii. American Fisheries Society*, Bethesda, Maryland. 1976.

Thompson, J., and L. Timchak, Letter from John Thompson, BLM, and Larry Timchak, USFS, Cooke City Area Proposed Mineral Withdrawal Team, Billings, MT to Anne Vandehey, USFWS, Helena, MT regarding request for Montana list of Federally listed endangered and threathened species, September 4, 1996A, p. 1.

Thompson, J., and L. Timchak, Letter from John Thompson, BLM, and Larry Timchak, USFS, Cooke City Area Proposed Mineral Withdrawal Team, Billings, MT to Mary Jennings, USFWS, Cheyenne, WY regarding request for Wyoming list of Federally listed endangered and threatened species, September 4, 1996b, p. 1.

Tonnsen, J. J. "Petroleum Geology of the Northern Part of Yellowstone National Park," *Wyoming Geological Association, 33rd Annual Field Conference Guidebook*, Geology of Yellowstone Park, 1982. pp. 289-295.

Tyers, D., *Wildlife Report for the New World Mine Preliminary Draft Environmental Impact Statement*, Gardiner Ranger District, Gallatin National Forest, USFS Northern Region, Montana, 8/21/96 draft, pp 174.

UNESCO (United Nations Educational, Scientific and Cultural Organization). Letter to George T. Frampton, Assistant Secretary for Fish, Wildlife & Parks, U.S. Department of the Interior, March 6, 1995.

UNESCO (United Nations Educational, Scientific and Cultural Organization) World Heritage Committee. Nineteenth Session, Berlin, Germany. 4-9 December 1995.

UNESCO (United Nations Educational, Scientific and Cultural Organization). Intergovernmental Committee for the Protection of the World Cultural and Natural Heritage. Revisions to the Operational Guidelines for the Implementation of the World Heritage Committee. World Heritage Committee Seventeenth Session, 1993. 36 pp.

United States Bureau of Mines, *Mineral Commodity Summaries*, 1995.

United States Department of Agriculture, Forest Service, Anatomy of a Mine From Prospect to Production, General Technical Report INT-35, Revised July 1983.

United States Department of Agriculture, Forest Service, Beartooth Mountains Oil and Gas Leasing Final Environmental Impact Statement, USDA, Custer National Forest, 1993.

United States Department of Agriculture, Forest Service, *Custer National Forest Land and Resource Management Plan*, USDA Forest Service, 1986.

United States Department of Agriculture, Forest Service, 1997. Failure Modes Effects Analysis, Training Case Study. PM 7115 01. Richmond, British Columbia, Canada. 1997.

United States Department of Agriculture, Forest Service, *Gallatin National Forest Land and Resource Management Plan*, U.S. Department of Agriculture, Forest Service, 1987.

United States Department of Agriculture, Forest Service. *Gallatin National Forest Plan. Amendment No. 12: Wild and Scenic River Management*, USDA-Forest Service, 1993.

United States Department of Agriculture, Forest Service. *Gallatin National Forest Plan, Amendment No. 19: Access Direction for Grizzly Bear Recovery Zone*, USDA–Forest Service, 1996.

United States Department of Agriculture, Forest Service. *Gallatin National Forest Plan Final Environmental Impact Statement*, Appendix C—Roadless Area Evaluation. Gallatin National Forest, 1987a.

United States Department of Agriculture, Forest Service, *Grizzly Bear Standards and Guidelines For The Gallatin National Forest, Sept. 1994.*

United States Department of Agriculture, Forest Service, Handbook 1909.15 *Environmental Policy and Procedures Handbook*, Washington Office Amendment 1909.15-92-1, Section 20.6, 09/21/92.

United States Department of Agriculture, Forest Service. *Landscape Aesthetics–A Handbook for Scenery Management*, Agricultural Handbook Number 701, Washington, DC, 1995.

United States Department of Agriculture, Forest Service. Memo on Gallatin National Forest 305(b) Report. Bozeman, Montana. December 8, 1995.

United States Department of Agriculture, Forest Service. *National Forest Landscape Management*, Volume 2., Chapter 1, "The Visual Resource Management System," Agricultural Handbook Number 462, 1974 and Chapter 2, Utilities, "The Visual Resource Management System," 1977, Agricultural Handbook Number 478, Washington, DC.

United States Department of Agriculture, Forest Service. *National Survey of Recreation and the Environment*, Athens, GA, 1994-95.

United States Department of Agriculture, Forest Service. *Recreation Opportunity Spectrum User's Guide*, Washington DC, 1982.

United States Department of Agriculture, Forest Service, Shoshone National Forest, *Clarks Fork of the Yellowstone Wild and Scenic River Study and Final Environmental Effect Statement*, USDA Forest Service, Cody, Wyoming. 1 Vol, 1979.

United States Department of Agriculture, Forest Service, *Shoshone National Forest Land and Resource Management Plan*, USDA-Forest Service, 1986.

United States Department of Agriculture, Forest Service. *Social and Economic Analysis Handbook* FSH 1909.17, Chapter 20, Washington D.C. 1996.

United States Department of Agriculture, Forest Service. *Soil and Water Conservation Practices Handbook, R1/R4*, Forest Service Handbook 2509.22. USDA Forest Service, Missoula, Montana. 1988.

United States Department of Agriculture, Forest Service. *Upper Columbia River Basin Assessment, Draft Environmental Impact Statement*, Walla Walla, Washington. 1996.

United States Department of Agriculture, Forest Service and Montana Department of Environmental Quality, *New World Mine Project Third Preliminary Draft Environmental Impact Statement*, Chapters 7, 8, 10, Summary, Chapter 2, 1996.

United States Department of Agriculture, Forest Service and Montana Department of Environmental Quality, New World Mine Project Third Preliminary Draft Environmental Impact Statement, *Aquatic Resources Technical Report*, 1996.

United States Department of Agriculture, Forest Service and Montana Department of Environmental Quality. New World Mine Project Third Preliminary Draft Environmental Impact Statement, *Social and Economic Technical Report*, 1996.

V54

United States Department of Agriculture, Forest Service and Montana Department of Environmental Quality, New World Mine Project Third Preliminary Draft Environmental Impact Statement, *Surface Water Technical Report*, 1996.

United States Department of Agriculture, Forest Service and Montana Department of Fish, Wildlife, and Parks, *Yellowstone Cutthroat Trout Native Species Management: An Action Plan for Implementation of the Yellowstone Cutthroat Trout Management Guide Within the Gallatin National Forest*, A Joint Management Effort between Gallatin National Forest and Montana Department of Fish, Wildlife, and Parks. A report from Gallatin National Forest, Bozeman, MT. May, B. 1994.

United States Department of Agriculture, Forest Service, and USDI National Park Service. December 1979. Guidelines for management involving grizzly bears in the greater Yellowstone area. 136 pp.

United States Department of Commerce. Regional Economic Information System, Employment and Income Data from 1969 - 1993, Economics and Statistics Administration, Bureau of Economic Analysis, Regional Economic Measurement Division, Washington D.C., CD-ROM. 1995.

United States Department of Commerce, Bureau of Census, "General Profile for Park County, Montana," 1990 Census of Population and Housing, Government Sharing Project, Oregon State University, internet site: http://govinfo.kerr.orst.edu

United States Department of Commerce, Bureau of Census, "General Profile for Park County, Wyoming," 1990 Census of Population and Housing, Government Sharing Project, Oregon State University, internet site: http://govinfo.kerr.orst.edu

United States Department of Commerce, Bureau of Census, "Income and Poverty Data for Park County, Montana," 1990 Census of Population and Housing, Government Sharing Project, Oregon State University, internet site: http://govinfo.kerr.orst.edu

United States Department of Commerce, Bureau of Census, "Income and Poverty Data for Park County, Wyoming," 1990 Census of Population and Housing, Government Sharing Project, Oregon State University, internet site: http://govinfo.kerr.orst.edu

United States Department of the Interior, Bureau of Land Management. "Forecast for Future Mineral Activity for the Cooke City Study Area," unpublished report by James Gruber, 1996.

United States Department of the Interior, Bureau of Land Management. Mineral Occurrence and Development Potential of Federal Minerals In The Proposed Cooke City Area Withdrawal," unpublished report by Jay Spielman, 1996.

United States Department of the Interior, National Park Service, Feb. 28, 1996. (Unpublished) News Release. Yellowstone bison in Teton. Linda L. Olson Public Affairs Officer, Yellowstone National Park. 1 pp.

United States Department of the Interior, National Park Service. *Alternative Transportation Modes Feasibility Study*, Volume 3, Yellowstone National Park, Wyoming, 1994.

United States Department of the Interior, National Park Service. Comments on *preliminary working papers, submitted to the U.S. Forest Service. April 8, 1996.*

United States Department of the Interior, National Park Service, *Draft Environmental Impact Statement Fishing Bridge Developed Area, Appendix 6: Cumulative Effects Model for the Grizzly Bear in the Yellowstone Ecosystem*, 1988.

United States Department of Interior, National Park System, *Draft EIS Fishing Bridge Camp Site Replacement*, Yellowstone National Park, October 1994, pg. 85.

United States Department of the Interior, National Park Service. Letter (D18YELL) announcing plans for resurfacing Northeast Entrance Road, Yellowstone National Park, Wyoming. June 17, 1996.

United States Department of the Interior, National Park Service. *Master Plan for Yellowstone National Park, Wyoming, Montana, and Idaho*, U.S. Department of the Interior, Denver, Colorado, 1974.

United States Department of the Interior, National Park Service. Visitor use information provided to ERO Resources Corp., January 1996.

United States Department of the Interior, National Park Service, Wilderness Recommendation, Yellowstone National Park, 1972.

United States Department of the Interior, Office of the Secretary. Letter to Dr. Bernd von Droste, Director, World Heritage Centre, UNESCO, June 27, 1995.

United States Department of the Interior and U.S. Department of Agriculture. *National Wild and Scenic Rivers System: Final Revised Guidelines for Eligibility, Classification, and Management of River Areas*, Federal Register, v. 47, pp. 39454-39460, September 7, 1982.

United States Department of the Interior and State of Montana. *Water Rights Compact*. Available from Montana Department of Natural Resources and Conservation or from National Park Service, 1994.

United States Department of Transportation, Federal Highway Administration. *Road Inventory and Needs Study*, U.S. Department of Transportation, October, 1994.

United States Fish and Wildlife Service. *Grizzly Bear Recovery Plan*, U.S. Fish and Wildlife Service, Missoula, Montana, 1993. 181 pp.

United States Fish and Wildlife Service. *Northern Rocky Mountain Wolf Recovery Plan*, U.S. Fish and Wildlife Service, Denver, Colorado, 1987.

United States Geological Survey, *Introduction to Geology and Resources of Gold and Geochemistry of Gold*, USGS Bulletin 1857-A, p.28.

United States Geological Survey, *Mineral Resource Assessment of the Absaroka-Beartooth Study Area, Custer and Gallatin National Forests, Montana*, edited by J.M. Hammarstrom, M.L. Zientek, and J.E. Elliott, USGS Open-File Report 93-207, Parts A-J, 1993.

United States of America. Nomination Form: Yellowstone National Park. Submitted to the Convention Concerning the Protection of the World Cultural and Natural Heritage, 1978.

Wedow, H., et al. *Mineral Resources of the Absaroka Primitive Area and Vicinity, Park and Sweet Grass Counties, Montana*, USGS Bull 1391-B, 1975.

Westech. *Noranda's New World Project: Aquatic Biological Monitoring, 1992*. Technical Report to Noranda Minerals by Western Technology and Engineering, Inc., Helena, Montana. January 1993.

Wilderness Society, *The Wealth of Nature: New Economic Realities in the Yellowstone Region*, Washington, DC, 1992.

Witzel, L.D., and H. MacCrimmon. "Role of Gravel Substrate on Ova Survival and Alevin Emergence of Rainbow Trout," (*Salmo gairdneri*). *Canadian Journal of Zoology* 59:629-636. As cited in : Meehan, W.R., ed. *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats*, American Fisheries Society Special Publication 19, 1981. p.103.

Wolle, Muriel Sibell. *Montana Pay Dirt, a Guide to the Mining Camps of the Treasure State*, Sage Books, Denver, 1963.

Yellowstone National Park. Determinations of rivers on National Park System lands which are eligible for Wild and Scenic River designation. Memo from Superintendent, Yellowstone National Park to Regional Director, Rocky Mountain Region. November 15, 1990.

Yellowstone National Park. *Maintenance Operations and Cost—U.S. 212 in Montana*, Submitted to the U.S. Forest Service and Montana Department of State Lands, 1994.

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